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ABSTRACT

Those who are responsible for the planning and implementation of a school plant realize the great changes that have taken place in the total process. Rapidly developing technology, new insights about human behavior, and a growing social conscience demand change in educational methodology. With changing methods there follows a requirement for different spatial relationships and altered or new facilities to accommodate the new processes. The need is obvious for educational space and equipment that can be easily and economically adjusted to adapt to the educational changes. Construction of school buildings today should not be so permanent in character that the building determines the program indefinitely, thereby leaving little opportunity for newer methods. This manual keeps such flexibility as a fundamental objective and contains suggestions, recommendations, and minimum requirements with regard to school facility planning. (Author/MLF)

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GUIDE FOR

PLANNING THE CONSTRUCTION

OF SCHOOL BUILDINGS

STATE OF NEW HAMPSHIRE

1971

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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FOREWORD

During the past decade New Hampshire has built a substantial number of excellent school facilities. There still remains, nevertheless, a great need to provide additional schools in many areas of the State. This is especially true in the central and southern parts of New Hampshire which have experienced a great increase in population during the past ten years.

Those who are responsible for the planning and implementation of a school plant realize the great changes that have taken place in the total process. Rapidly developing technology, new insights about human behavior, and a growing social conscience demand change in educational methodology.

With changing methods there follows a requirement for different spatial relationships and altered or new facilities to accommodate the new processes. The need is obvious for educational space and equipment that can be easily and economically adjusted to adapt to the educational changes. Construction of school buildings today should not be so permanent in character that the building determines the program indefinitely, thereby leaving little opportunity for newer methods.

This Guide for Planning the Construction of School Buildings for New Hampshire has been revised to keep such flexibility as a fundamental objective. The manual contains suggestions, recommendations and minimum requirements with regard to school facility planning. Basic requirements have been established in accordance with sound school planning.

Sincere appreciation is extended to all who have helped in the revision of this material. I know of the many hours the committee has spent in completing this manual, and I am sure that the school districts in New Hampshire will profit from their work, and that the children of the State will find enjoyment in and will benefit from the needed facilities in the years ahead.

Newell J. Paire

Newell J. Paire
Commissioner of Education

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GUIDE FOR PLANNING THE CONSTRUCTION OF SCHOOL BUILDINGS

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* Chapters marked with (*) contain minimum standards for approval of project for building aid.

Acknowledgement is given to the New Hampshire School Board Association for its assistance in the publication of this Guide.

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Long-range planning for educational needs is a vital part of any community's plan for growth and orderly development. The educational climate provided by a community determines to a large extent its outlook for the future. A school plant provides the general environment in which the learning process is to take place and therefore must be the end result of a careful process of preparation and development. The participation and active involvement of school board members, citizens, and professionals is essential to the success of any school building program. Long-range planning takes time; a sound functional school plant must meet the immediate needs of the community and at the same time offer flexibility to satisfy future educational requirements. A school district which expects to vote in the spring for a building or addition that is needed for the fall will usually achieve only short-term objectives and may find itself faced with another crisis a few years later. The school board should make a careful assessment of priorities in order of their importance for long-range planning.

PARTICIPANTS IN THE PLANNING PROCESS

The planning process requires making many decisions on the part of several agencies and individuals. The participants may be divided into three categories: agencies or persons directly responsible for educational administration and policy making; agencies or individuals from the community, including the school committee; and professionals retained by the school board.

The first category includes the following:

A. STATE BOARD OF EDUCATION -- This board, made up of seven lay citizens appointed by the Governor and Council, is the highest policy-making body in the state educational system. By law, the board is responsible for the examination, review, and approval of all building programs for which school building aid application is made. (cf. RSA Chapter 198:15.)

B. STATE DEPARTMENT OF EDUCATION -- The Department of Education carries out the policies of the State Board of Education and provides services for the school districts. With reference to school building programs, the department has the following functions:

1. Works with local districts and officials to develop effective educational programs.
2. Assists in surveying school building needs at the local level.
3. Assists in the selection of school sites.
4. Establishes standards for school construction.
5. Provides information on construction methods, materials, and costs.

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6. Consults with local districts in establishing educational specifications to assure functional adequacy in the program.
7. Reviews preliminary and final drawings and specifications for evaluation and approval.
8. Recommends to the State Board of Education approval of drawings and specifications for granting building aid.

C. LOCAL SCHOOL BOARD -- The district board of education is the cornerstone of school organization at the local level. It establishes educational policies pertaining to the local district and is the agency to initiate long-range planning for school needs, since one of its charges is continual evaluation of the functioning of the educational process on the local level. The board performs the following functions with regard to school building:

1. Initiates the process after evaluation of the district's needs.
2. May appoint a building committee (see below).
3. Works with the administrative and instructional staff as well as lay citizens in establishing educational specifications for the project.
4. Keeps the public informed of school needs and the progress made on construction.
5. Engages professionals, such as an educational consultant, early in the building program to aid in long-range planning, and an architect at a later stage to prepare drawings and contracts.
6. Approves school sites, plans and drawings, evaluates and awards bids, signs the necessary contracts, supervises the entire building process, and approves the completed project.

D. SUPERINTENDENT OF SCHOOLS AND STAFF -- The Superintendent of Schools is the executive officer of the school board. In a building program it is his duty to provide and coordinate capable assistance and services to the school board. The superintendent and his staff will:

1. Utilize the assistance of principals, teachers, students, and nonprofessional personnel in the total building program.
2. Provide the school board with facts to assist its members in the multiple decisions a building program entails.
3. Convey to the architect a clear, concise statement of the educational specifications to be fulfilled in the building.
4. Assist the school board in presenting the program to the public.
5. Develop a financial plan for costs of construction, preparing bond issues, etc.

E. SCHOOL BUILDING COMMITTEE -- In New Hampshire it is a commonly accepted practice to appoint a building committee to work with the local school board in a building project. This body actually overlaps the next category, as it is composed chiefly of laymen. In the case of a school building program, however, the building committee may be considered a part of the educational structure, since its sole function is to assist the school board in making long-range plans and to assure that these plans are

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translated into a building program. The committee is usually composed of one or more school board members and citizens from various segments of the community, its size being determined by the scope and complexity of the task to be undertaken. Except in cities, the building committee carries little legal authority in such matters as selection of site or construction of the building. RSA 199:3 states that all new schoolhouses in cities shall be constructed under the direction of a joint building committee, chosen in equal numbers by the city council and the school board. In general, the building committee performs the following functions:

1. Keeps itself informed of the latest trends in education and construction to provide guidance in carrying out the educational specifications.
2. Assists in the formulation of educational specifications, taking into account the needs of the district.
3. Assists in the selection of school site and architect.
4. Reviews drawings and specifications in order to make recommendations.
5. Assists the school board in keeping the public informed of the project's progress.

The second category of participants consists of agencies and individuals from the community, whose direct involvement in the planning process is essential to the success of any building program.

A. PLANNING AND ZONING BOARDS -- The multiplicity of problems that beset any community today (urban or rural) has brought about widespread acceptance of the necessity for long-range planning in all areas. Planning boards and commissions have been formed for orderly development. Such groups should be involved in the planning of school building programs. First, there may already be in existence a subcommittee on planning for school needs, which must be involved in the program. Second, local planning and zoning regulations must be observed in planning construction and selection of site. Third, and most important, planning for schools cannot be carried on in a vacuum; educational services must be integrated with the full range of public services, both with regard to cost and to the total development of the community. Overall planning for communities can produce effective results, and the educational planner must be a prominent partner in the process. He has a two-fold role: he must be acquainted with the other agencies, and he must make community planners cognizant of school needs and problems. Planning boards and agencies are set up to deal with all or some of the following problems, each of which affects the educational system:

1. Renewal of urban centers
2. Population growth and movement
3. Industrialization of the community -- potential for fiscal support
4. Development of highway systems (local, state, and interstate)
5. Availability of land and sites
6. Building codes and zoning regulations
7. Providing for future educational needs
8. Community relations

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B. THE SCHOOL COMMUNITY -- Teachers, administrators, counselors, students, nurses, custodians, and other noninstructional personnel should be consulted in the following aspects of a building program:

1. Establishment of educational specifications.
2. Survey of present and future needs of the district.
3. Formulation of long-range educational goals.
4. Advice on features to be included in the building in accordance with latest trends and special needs.
5. Evaluation of present methods of instruction and recommendations for possible improvements.
6. Liaison between school and community.

C. THE COMMUNITY AT LARGE -- The community should be kept informed at every stage of the project. Articles in the press, availability of school board members and administrative personnel to interested citizens, and public hearings are some of the means for maintaining two-way communication throughout the planning and construction process. Suggestions from the public should always be given consideration by those in charge of planning, and the community should be told of the attention given these suggestions.

It may seem an almost impossible task to bring together the ideas of the numerous agencies, committees, and individuals listed above into a cohesive program that will achieve the desired goals. This is the function of the third category of participants in the planning process, i.e., the professionals. They are selected and placed under contract by the school board for the sole purpose of bringing the project to fruition.

A. THE EDUCATIONAL CONSULTANT -- The growing complexity of school planning often requires the services of an educational consultant to develop a master plan for the district. Educational consultants may be employed by the district to work with the committee, school people and architect. Under these circumstances he is paid by the district. Architectural firms are now adding such professionals to their staffs in which case the cost would be a part of the fee of the architect. The consultant in the first situation may be a part of a firm that specializes in this type of work or can be a person working as an individual. The professional consultant has wide expertise in the educational field, which he applies to the specific needs of the district. He can perform the following services:

1. Surveys the present situation in the district.
2. Formulates future educational needs.
3. Develops alternative plans to fulfill these needs.
4. Analyzes and evaluates each alternative response.
5. Works with the school board and/or building committee at all stages.
6. Helps in presenting the program to the public.
7. Continues, after completion of the master plan, to evaluate the implementation of the educational philosophy and objectives of the district. (See Chapter III for additional information).

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B. ARCHITECT -- As soon as the needs of the district have been determined, an architect should be retained. It may be advisable to employ this professional from the inception of the building program. IT IS A POLICY OF THE STATE BOARD THAT A REGISTERED ARCHITECT MUST BE EMPLOYED TO DESIGN THE PLANS OF THE PROPOSED BUILDING TO MAKE THE PROJECT ELIGIBLE FOR STATE BUILDING AID. According to statute (RSA 310), a person must be a registered architect in order to practice in New Hampshire. The architect contributes to the building program as follows:

1. Advice and assistance in the selection of a site.
2. Assistance in determining the physical requirements of the project and developing preliminary budgets.
3. Preparation of preliminary sketches and studies incorporating educational specifications.
4. After thorough review, preparation of detailed drawings, plans, specifications, and contracts for the project.
5. Assistance in obtaining approval by the State Department of Education for building aid.
6. Preparation of necessary forms and information to advertise the project for bid, assistance in bid opening, advice to the committee on awarding the contract.
7. Supervision and administration of the construction phase of the project.
8. Certification of payments to the contractor, advice as to final acceptance of the building.
9. Authoritative, professional presentation of the building program to the public, especially with regard to costs and details of construction.

A more detailed discussion of the professionals' role is to be found in Chapter III of this Guide.

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GUIDING PRINCIPLES FOR A SCHOOL BUILDING PROGRAM

Most schools are planned and designed to be used for many years. To provide long-term usefulness to the district and to justify the expensive investment in a school plant, the following principles are suggested as guidelines to a committee:

1. FLEXIBILITY -- Modern technology has made available a wide choice of versatile construction materials that will make a building adjustable to future changes in curriculum and teaching methods.
2. DURABILITY -- Buildings should be constructed of durable materials that are not necessarily expensive. On the other hand, the initial higher cost of good sound materials may be offset by lower operational or maintenance expense.
3. EXPANSIBILITY -- If current population trends continue, most schools will have to be expanded to meet increased enrollments. The building design should provide for the possibility of future additions, while leaving the original concept of the structure intact.

4. ACCESSIBILITY -- Buildings should be designed to allow easy flow of traffic for all who use the building. This principle applies not only to vehicular traffic (accessibility to public thoroughfares and ample provision for parking), but also to the establishment of good traffic patterns inside the school.

5. ENVIRONMENTAL -- Aesthetic values must be considered in planning the total school environment. In order to provide the best possible learning environment, the surroundings should be comfortable, pleasing, and safe.

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TIMETABLE FOR PLANNING SCHOOLHOUSE CONSTRUCTION

To insure orderly progression of the planning process, school boards or building committees may find the following useful:

1. Basic analysis of needs
   a. Evaluation of existing plant facilities.
   b. Pupil enrollment projection.
   c. Determination of the educational philosophy of the district, evaluation of the instructional program.
   d. Analysis of financial status.
   Note: If an educational consultant is to be engaged, selection should be made at this stage.
2. Dissemination of information at the local level through a coordinated public information program.
3. Development of detailed written educational specifications (See Chapter IV for suggested outline.)
4. Selection of architect.
5. Selection of school site with the assistance of the architect and other specialists.
6. Development of preliminary drawings by architect in accordance with educational specifications.
7. Review preliminary drawings with State Department of Education for approval.
8. Complete detailed specifications drawn up for furnishings and equipment for use in the building.
9. Securing local authorization of funds.
10. Preparation of working drawings to be submitted to the State Department of Education for final approval. Prior approval of other state agencies secured before submission to State Department of Education.
11. Completion of necessary forms and application prior to submission of plans for bid.
12. Advertisement of construction documents for bid, receipt and evaluation of bids, award of contract.
13. Completion of site development and building construction, including furniture and equipment.
14. Dedication and presentation of building to public and other officials.

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CHAPTER II - LEGAL REQUIREMENTS

Certain legal procedures must be followed if the building project is to be eligible for building aid. Listed below are the major agencies, state and local, designated by statute or regulation to see that building plans and specifications meet the requirements for approval:

1. STATE BOARD OF EDUCATION
   a. Approves plans and specifications of building projects to qualify for building aid. RSA 198:15-a through h. (See Chapter XV of this manual for steps necessary for approval).
   b. Plans and specifications must meet provisions of RSA 155-A: "Construction of schools which have more than one hundred occupants will conform to the National Building Code."
   c. Enforces provisions of RSA 155:8-a: "Making Buildings Accessible to, and Usable by, the Physically Handicapped."

   Address: State Board of Education
   State Department of Education
   State House Annex
   Concord, New Hampshire 03301

2. NEW HAMPSHIRE WATER SUPPLY AND POLLUTION CONTROL COMMISSION

Two of the most important factors to be considered in selection of a school site are the availability of a water supply and means of sewage disposal. The New Hampshire Water Supply and Pollution Control Commission is responsible for enforcing the statutes relating to these two areas. The following guidelines should be used by the committee and/or architect:

   a. School sites, when possible, should be located where a public sewage disposal system is available.
   b. If a public sewage system is not accessible to a school site, THE COMMISSION SHOULD BE CONTACTED AS SOON AS POSSIBLE, PARTICULARLY BEFORE THE SITE IS SELECTED.
   c. As provided under statutes RSA 148:25 and 149-E, plans for any proposed new system must be submitted to the Water Supply and Pollution Control Commission for review and approval at least thirty days before construction is started.
   d. All plans submitted for review must have been prepared by an engineer registered to practice in the State of New Hampshire.

All details of a water supply system, unless a municipal system is available, must be approved by the Commission.

Address: New Hampshire Water Supply & Pollution Control Commission
Loudon Road
Concord, New Hampshire 03301

3. DEPARTMENT OF SAFETY (State Fire Marshal)

Each set of drawings for building projects shall be submitted to the Division of Safety Services for review and approval. If they meet the requirements, the State Fire Marshal will forward a certificate of approval to the State Department of Education. The Division of Safety Services should be consulted with regard to the following laws and regulations:

1. Standards relating to fire escapes and fire exits.
2. Safety to Life in Places of Assembly (Coconut Grove Law).
3. Installation of power oil burner equipment.

Address: Department of Safety
State Office Building
85 Loudon Road
Concord, New Hampshire 03301

4. DIVISION OF PUBLIC HEALTH

The Division of Public Health publishes a code for sanitary food conditions and, in conjunction with the Department of Education, sets standards for sanitary conditions in school buildings.

Address: Division of Public Health
61 South Spring Street
Concord, New Hampshire 03301

5. BOARD OF REGISTRATION FOR ARCHITECTS

By statute one must be registered to practice architecture in the State of New Hampshire. Also, by policy of the State Board of Education, all building plans and specifications must bear the stamp of a New Hampshire registered architect if the project is to qualify for building aid.

Information may be obtained from the Board.

Address: Board of Registration for Architects
36 Carpenter Street
Keene, New Hampshire 03431

6. DEPARTMENT OF LABOR

The Department of Labor enforces statutory requirements regarding working conditions, conditions of employment, and the establishment of minimum wage rates for public buildings including schools.

In addition, the Department oversees installation and inspection of boilers and elevators.

Address: Department of Labor
State House Annex
Concord, New Hampshire 03301

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7. DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS

In certain cases the Department of Public Works and Highways should be consulted regarding roads leading to and from the site, as well as drainage of surface water from the area.

Address: Department of Public Works and Highways
State Office Building
85 Loudon Road
Concord, New Hampshire 03301

8. NEW HAMPSHIRE BOARD OF UNDERWRITERS

School boards, building committees, and architects should confer with the New Hampshire Board of Underwriters on matters pertaining to the design of a building, materials to be used, safety factors, especially with regard to making a structure fire resistant. All these factors influence the insurance program of the school district.

Address: New Hampshire Board of Underwriters
Loudon Road
Concord, New Hampshire 03301

9. LOCAL PLANNING AND ZONING BOARDS

School planners should be aware of the requirements of local building and zoning codes and regulations. Although it is the duty of the architect to know the details of the local provisions, the school board has the ultimate responsibility of insuring that the codes are followed. Many local codes are more restrictive than the National Building Code; certain permits may be required, and other conditions established by the local fire chief or district must be fulfilled. All these factors must be taken into account during the planning phase of the project.

CHAPTER III - THE ROLE OF THE PROFESSIONAL

The professional renders invaluable assistance to the school building committee and/or the school board in promoting cooperation of the many agencies and individuals involved, and in assuring smooth progress of the project from inception to completion. This section deals in detail with two types of professionals, the educational consultant and the architect. This does not mean that the services of other professionals (such as legal counsel) will not be required at some stage of the project, but these two play such an integral part in the planning and execution of any school building program that an outline of their functions may be helpful to planners in selecting competent and professional advisers.

EDUCATIONAL CONSULTANT

It is not mandatory for a school board to engage an educational consultant, but it is highly recommended in districts where little long-range planning has taken place, whether for educational or other needs, or where it is difficult to analyze educational needs due to the many factors that must be considered. If a consultant is to be hired, it should be done as soon as possible after the school board decides to initiate a building program. The analysis of educational needs in a school district is a complicated and time-consuming project, to which an independent team of consultants can bring both objectivity and specialization. The major elements of the survey are as follows:

1. Goals and aspirations -- dimensions of the effort.
2. Nature of the students to be educated -- aptitude, achievement, and "follow-up" studies.
3. An educational plan and specifications
   a. Administrative units
   b. Curriculum
   c. Instructional practices
   d. Auxiliary services
4. Enrollment projections
   a. Census data
   b. Birth rate analysis
   c. In-and-out migration
   d. Historic trends
   e. Available house lots
   f. Density study
   g. Private and parochial balance and future planning
   h. Building permits and utility company data
   i. Retention ratios
5. Space needs
   a. Types of space required by educational plan
   b. Amounts of each type of space
   c. Best use of existing space
   d. Identification of reasonable alternatives
6. Analysis of each alternative
   a. Construction costs
   b. Equipment costs
   c. Architectural and engineering designs

d. Land acquisition and site development
e. Debt service planning
f. Operational costs
g. Tax impact

7. Evaluation of alternatives and plan for action

Upon completion of the survey, the school board or building committee will have in hand a master plan based on the consultant's specialized knowledge in combination with an intensive study of local conditions and needs.

THE ARCHITECT

In order to qualify for state building aid, the plans and specifications of a proposed school building must be prepared by an architect registered in New Hampshire. The following information regarding the architect's role is intended to help the committee select a qualified person:

SERVICES RENDERED BY THE ARCHITECT

The architect's services are personal, and he offers his ideas, skills, imagination and advice to the committee. His services include:

1. Conferences -- It is the responsibility of the school board, with the assistance of the superintendent of schools, his staff, and frequently with the advice of an educational consultant, to prepare information regarding future educational needs, the curricula to be offered, the specialized facilities to be provided, etc. Conferences between the educational personnel and the architect provide him with the desired goals and objectives. The teamwork resulting from these preliminary conferences often determines the quality of the final project -- the new school plant.

2. Site Inspections -- The architect works with the building committee to inspect sites under consideration and assists in the comparative evaluation of possible sites. The architect gives advice on topography, orientation, drainage, size and shape, while the building committee will concern itself with transportation costs, land values, and the direction of community growth.

3. Preliminary Studies -- The architect presents his recommendations in the form of schematic drawings. These preliminary sketches and specifications establish the character of the building and must be very thoroughly reviewed to make sure that the finished structure will represent the best solution to the district's problems.

4. Preliminary Cost Estimates -- These estimates are only approximations, since final decisions as to structure, equipment, and materials are not made at this stage of the program. Also, allowance must be made for the fact that it may take several months before a building program is put into operation and costs may well be higher at the time of construction. However, the architect's estimates are essential in preparing budgets and determining if project costs are within the district's capacity to pay.

5. Working Drawings and Specifications -- The architect's working drawings and specifications constitute the construction documents on the basis of which bids are secured and the actual building is erected. The drawings will include a site plan, floor plans, elevations, sections, details, and other information as well as a complete description of all electrical, plumbing, ventilation, heating, structural work, and other related mechanical services. The specifications describe the materials to be used and the quality of workmanship required of the contractor.

6. Contracts and Bidding -- The architect advises on the bidding procedures, helps to evaluate the bids received, and assists in the preparation of contract documents, such as proposal, contract and bond forms, etc. While there are other ways to bid, the American Institute of Architects and the Association of General Contractors favor the "single bid" system.

7. Supervision -- The architect assumes general supervision of the project, including the checking of shop drawings, approval of materials, periodic observation of the work, expedition of progress.

8. Administration -- It is the architect's responsibility to keep complete accounts of the contractor's work, to issue certificates of payment for money due the contractor, and to provide general administration of the business aspects of the project until final acceptance of the building by the school district.

9. Owner's Agent -- Throughout the period of construction, the architect acts as the owner's agent, thus relieving the building committee and the superintendent of many time-consuming details.

In addition, the architect gives advice on such matters as color selections, choice of equipment and furnishings, maintenance operations, and insurance problems.

When Should the Architect be Employed?

From the preceding description of the architect's services, it is apparent that his selection and employment should be made at an early stage in the planning process, before a site is selected and before other final decisions are made regarding the building. The school district should appropriate sufficient funds to cover the cost of a preliminary study and the architect's fee.

Selection of an Architect

1. Direct Selection -- When there is general agreement among the members of a school board or committee that an architect, well known to all of them, is the only person for the job, and when he is hired forthwith, it is known as direct selection. However, for all its advantages of speed and familiarity, this procedure may result in overlooking a better qualified architect.

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2. Comparative Selection -- This frequently-used method involves selection from several candidates who are given equal opportunity to present evidence of their qualifications. Committee members will have to spend considerable time interviewing candidates, checking out qualifications, and evaluating and comparing results. See Appendix for suggestions regarding selection of an architect.

The candidates retained for final consideration should be interviewed individually. It is important that each be presented with the same facts and asked the same questions.

Whenever possible, the committee should visit schools designed by the candidates. Visual inspection, and discussion with those using the facility, will provide valuable background information for reaching a decision.

3. Competitive Selection -- This third method may be used for larger projects. A formal competition is conducted in accordance with procedures prescribed by the American Institute of Architects. This procedure may result in uncovering talent that might otherwise have been overlooked. However, it is generally cumbersome and time consuming, thus not used often.

Professional Ethics

The architect's code of ethics is contained in the "Standards of Professional Practice" issued by the American Institute of Architects. Too lengthy to be included here in full, its essential features are as follows:

1. The profession of architecture calls for men of integrity, with business aptitude and artistic and technical ability. The architect's responsibilities cannot be properly discharged unless his motives, professional conduct, and ability command respect and confidence.
2. The architect receives remuneration for his professional service only and should not place himself in a position to receive commissions or allowances from any other source.
3. An architect may propose the services he is able to perform, but shall not, except under unusual circumstances, offer his services without compensation, and shall not submit free sketches.
4. An architect shall not enter into competitive bidding against another architect on the basis of compensation. He shall not use donation or misleading information on cost as a device for obtaining an advantage.

Architectural Fees

The New Hampshire Chapter of the American Institute of Architects has adopted a Schedule of Recommended Minimum Fees. This schedule is subject to change, since the Chapter periodically reviews the rates. A copy of the most recent schedule can be obtained from any architect practicing in the State.

An architect may charge a fee higher than that listed in the schedule. There are times when the architect is asked to perform supplementary services not covered by the basic fee. Under such circumstances, committees should realize that there might be extra costs for such services. Committees should be very familiar with the details of the contract to avoid any misunderstandings.

Contract Between Owner and Architect

Any undertaking involving expenditure of public funds should be conducted to avoid misunderstandings, disagreements, and possible legal actions. A written contract with the architect accomplishes this objective. The AIA's Standard Forms of Agreement are the most frequently used; copies may be secured from any architect. Building committees and school boards should carefully review these documents with legal counsel before entering into a written contractual agreement.

Project Representative (Clerk-of-the-Works)

At the owner's request, the architect will provide a full-time project representative, sometimes called a clerk-of-the-works, to assist the architect in carrying out his responsibilities at the construction site. While the architect makes frequent periodic inspections of the progress of the work, the full-time representative, as the term suggests, is on the job throughout the construction period.

The responsibilities and authority of the project representative are described in an AIA document entitled "Suggested Instructions to Full-Time Project Representatives." A copy may be secured from the architect.

The project representative's duties include the following:

1. Acts as liaison between architect and contractor.
2. Observes progress of work and conformance with contract.
3. Observes tests required by contract.
4. Keeps records such as daily diary, log of shop drawings, changes, etc.
5. Reviews requisitions for payment.
6. Advises architect of any special job problems.

The project representative does not have authority to order any deviations from the drawings or specifications, or to interpret these contract documents, or to approve material samples or shop drawings.

Although the project representative acts under the direction of the architect, his salary is paid by the owner, either directly or through reimbursement to the architect.

Change Order

A change order is written authorization for making a change in the original drawings, specifications, and contract documents. Change orders usually originate in one of the following ways:

1. The owner desires a change in the original conditions of work and requests the contractor, through the architect, to give a quotation on the change.

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2. The contractor may ask for a change due to extra work that might result from conditions not know at time of bidding.

In either instance the architect obtains the necessary quotation for the additional work or for allowance of work not done. The necessary forms are completed by the architect and signed by both the owner and the contractor. There should be no deviation from the original specifications of the job without a signed change order by the owner and the contractor, and work should not begin without a signed change order.

Verbal authorization for change in the work specifications should not be given or accepted by either the owner or his representative, the architect, the contractor or his representative.

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The planning of any school facility, whether an addition to an existing school or an entirely new plant, is an opportunity for a school district to reassess its educational philosophy, goals, and objectives. Translated into educational specifications, such a review will state the problems to be solved in terms of facility requirements for the improvement of education in the district.

A building program falls into three phases: planning, design, and construction (including equipment). The educational specifications should be drawn up early in the first phase so that all later steps can be coordinated to fulfill the primary purpose, which is to provide a better learning environment. The educational specifications state the problem in a concisely written statement of the instructional program to be offered in the new school plant. The architectural plan and the actual building represent the solution to the problem as stated. In order to serve their purpose, the educational specifications must state the philosophy and objectives for learning and teaching, the methods to be used to implement these goals, and the tangible requirements of space, equipment, and furniture needed to carry out the program.

The following brief outline may serve as a useful guide for writing a set of specifications:

1. Philosophy and objectives of the program
   Questions that might be considered in addition to a general statement of philosophy are:
   a. Student freedom and independence
   b. Responsibility and structure of discipline
   c. Use of free time by the students
   d. General attitudes toward:
      (1) Interscholastic athletics, intramural athletics, recreational sports
      (2) Special programs for remedial work and education for the handicapped
      (3) Use of school plant by the community for adult education, recreational programs, etc.
2. Enrollment projections, by grade level, for effect on future building needs.
3. Curriculum
   a. Curriculum offerings (see also the Elementary and Secondary Minimum Standard Publications).
   b. Types of teaching and learning activities (e.g., use of media, independent study, individualized instruction, large group/small group patterns, symposiums, round-table discussion, seminars, etc.)

c. Student grouping patterns, minimum and maximum size of groups (include the total number of instructional groups to be served, based on enrollment projections).
d. Staffing patterns including the anticipated number of teachers and teacher aides.
e. Staff requirements such as work areas, lounges, offices, cafeteria space, etc.
f. Administrative services
g. Resources and services needed to support the instructional program (health, guidance, food, transportation, etc.)

4. Space requirements, taking into consideration proposed accreditation standards.
   a. Number of spaces, square feet, pupil capacities
   b. Comprehensive list of furniture and equipment for each space, including number of pieces, performance quality, measurements.
   c. Storage needs, including type, size and quantity of equipment, supplies, teaching materials; also linear feet, depth, and height necessary to store items; lockable or unlockable, adjustable or fixed, displays. Each item, movable or secured, should appear on this list.
   d. Utility requirements: number, voltage, spacing, locations of outlets, lighting, TV, clock, intercom, plumbing.
   e. Special considerations: aesthetics (color), acoustics (floor-wall-ceiling), climate control (heat-ventilation), size flexibility, traffic flow, performance quality, toilets, etc.
   f. Priority of space relationships between learning areas.

5. Utilization of site: map of site, topographical survey, character of land, site in relation to planning, optimal use for educational purposes of natural features of site.

6. Site service provisions: for pedestrians, for parking and bus service (storage); approaches for automobiles, pedestrians, bicyclists; road requirements.

The use of educational specifications offers several advantages beyond the immediate purpose of a new plant. A good set of specifications should result in better communication between educator and architect, as well as improvement in the instructional program, particularly where new teaching and learning methods are to be adopted. The specifications may also be used to orient new faculty members to the school by providing an insight into the relationship between physical features and curriculum. When the time comes to evaluate the new facility, the specifications are an invaluable instrument for judging whether the school planners have succeeded in translating their aspirations into a functional structure that will achieve the desired educational goals.

CHAPTER V - SITE SELECTION*

Choice of a suitable site for the new school is one of the first steps toward the realization of the plans formulated during the first stage of the project. The type of site chosen plays an important role in determining how well the final structure will meet all requirements, educational, aesthetic, and technical. The criteria for selecting a school site must be broad and sufficiently flexible to accommodate variations in the size and type of building to be constructed, to fulfill the needs of the educational program, and to make allowance for future expansion and possible changes in curriculum or teaching methods. School planners must work closely with the architect, community planners, engineers, and other professional consultants before a final choice is made.

The State Department of Education should be consulted before taking steps to acquire a site. The State Department will assist the committee in the selection and evaluation of areas under consideration. Other advisory agencies whose services should be used by the local committee are the N. H. Department of Resources and Economic Development, the N. H. Soil Conservation Service, the N. H. Water Supply and Pollution Control Commission, the N. H. Department of Public Works, local planning and zoning boards, as well as specialized agencies to solve particular problems. As mentioned elsewhere in this Guide, it is advisable to retain the services of an architect as early as possible in the building program; his professional training and experience will be invaluable in the process of site selection, and his early involvement in the project will enable him to do a better job of designing a building adapted to the site and the educational needs of the community.

The committee faces a serious responsibility in choosing a site; not only must the site be suitable for present needs, but it must provide for future increases in enrollment and changes in the educational program. A sobering thought for the committee to consider is that the growing scarcity of available land, steadily increasing costs, and ever more stringent zoning regulations may well make this one of the last opportunities for selecting adequate acreage for school needs.

STANDARDS FOR SITE SIZE

The site must be large enough to meet immediate needs, such as present enrollment, the planned educational program, and parking spaces; there should also be sufficient land for expansion. To determine this last factor, accurate enrollment projections should be made. In order to meet the requirements for building aid, the site must be large enough to accommodate the projected enrollment for the district. Other site considerations are the size of the building, landscaping around the building, roadways, parking and service areas, playgrounds or athletic fields (including possible provision for interscholastic athletics).

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THE FOLLOWING WILL BE THE MINIMUM SITE SIZE APPROVABLE FOR BUILDING AID FOR NEW CONSTRUCTION:

ELEMENTARY SCHOOL:	FIVE ACRES OF USABLE LAND, PLUS ONE ADDITIONAL ACRE FOR EACH 100 PUPILS TO BE IN ATTENDANCE AT THE SCHOOL.
MIDDLE SCHOOL OR JUNIOR HIGH:	TEN ACRES OF USABLE LAND, PLUS ONE ADDITIONAL ACRE FOR EACH 100 PUPILS TO BE IN ATTENDANCE AT THE SCHOOL.
SENIOR HIGH SCHOOL:	FIFTEEN ACRES OF USABLE LAND, PLUS ONE ADDITIONAL ACRE FOR EACH 100 STUDENTS TO BE IN ATTENDANCE AT THE SCHOOL.

School districts planning facilities for a different organizational pattern from the one above (for instance, K-6, 7-12) shall consult the State Department of Education as to the number of acres required for approval. If land is owned by the district, town, or city, adjacent to or in proximity to the school site under consideration, this acreage may be included in the minimum number of acres required, subject to approval by the State Department of Education.

ADDITIONS TO EXISTING BUILDINGS ON PRESENT SITE

Many school districts own good sound buildings which with an addition and/or renovation could accommodate increased enrollment. Frequently, however, the sites of these existing buildings do not meet present minimum size requirements. In such cases the district may appeal to the State Board of Education for a waiver of the site standards. Approval of the waiver by the State Board of Education may be given after evaluation by the consultants in the Department.

BUILDING AID FOR SITES AND SITE DEVELOPMENT

It is the policy of the State Board of Education to approve building aid for the purchase and development of school sites. HOWEVER, IF A SITE IS PURCHASED PRIOR TO THE BUILDING PROGRAM, NO AID WILL BE PAID UNTIL WORK ON THE ACTUAL BUILDING IS STARTED. The aid paid on the site purchase is based on the total cost of the land, multiplied by the percentage to which the district is entitled, divided by the number of years for which bonds are issued to finance the building project.

FACTORS TO CONSIDER WHEN SELECTING A SITE

1. QUALITY OF THE SITE
   a. The site should be suitable both in size and shape for present and anticipated enrollment.
   b. There should be as few hazards as possible, i.e., traffic, disturbing noises, smoke, dust, odors, power lines, etc.
   c. The site should be as free as possible of surface, overhead, or underground utilities.

d. The soil should be satisfactory for the foundation of the building and suitable for landscaping.
e. The land should be as level as possible, although buildings and outdoor areas can be designed on multiple levels to offset some topographical handicaps.

2. ACCESSIBILITY
   a. The site should be easily accessible to both the school population and the community.
   b. There should be ample space for on-site parking and off-street loading and unloading of buses.

3. LOCATION
   a. If at all possible the site should be located so that it can be served by municipal sewer and water systems. BEFORE ACQUISITION IS CONSIDERED, THE N. H. WATER SUPPLY AND POLLUTION CONTROL COMMISSION SHOULD BE CONSULTED TO MAKE A CAREFUL CHECK OF SITES WHERE MUNICIPAL WATER AND SEWAGE ARE NOT AVAILABLE.
   b. When possible, a site should be in proximity with other educational, recreational, and cultural institutions.
   c. The site should be located so as not to be affected by future industrial or commercial expansion.

4. ZONING AND PLANNING REGULATIONS must be considered.

5. AESTHETICS -- Pleasing surroundings provided by the site will enhance the educational experience.

6. COST -- The cost should be within reasonable limits.

TEST BORINGS

It is strongly recommended that test borings be taken before any choice of site is made. These borings will show if it is at all practical to build on the site and will also be helpful in choosing the best place for the building on the site. In addition, such borings provide information on sub-surface water conditions, which play an important part in solving problems of water supply and sewage disposal.

Listed below are some suggestions with regard to test borings:

1. NUMBER OF BORINGS RECOMMENDED
   To make a choice between alternate sites.....1 Boring Per Acre. To pinpoint a desirable location for the foundation of a structure on a large site, necessitating minimal rock excavation.....1 Boring Per Acre.

   Within the proposed building area.....1 at each Corner of Building
   1 in Middle of Building
   1 per 2,500 sq. ft. Building area, maximum 100 ft. apart.

2. DEPTH OF BORING (RULE-OF-THUMB MINIMUM
   Borings should extend at least to the depth that loads will affect soil strata.

Type of a Structure	Below Spread Footings	Below Piles	Below Caissons
Low Structures	10 Feet[b]	10 Feet[b]	10 Feet[b]
Tall Structures[c]	20 Feet	20 Feet	To rock

a. This schedule lists the depth recommendations for typical conditions. It is usually desirable to have the first boring, and at least one-fifth of the additional borings, extend a minimum 20 feet deeper than the typical borings.
b. Minimum at least 10 feet into good bearing strata.
c. Minimum depth never less than the narrow plan dimensions of the structure.

The most generally accepted test borings are core borings in rock; wash and auger borings in soil. The ground water level should be determined in all borings. Boring reports should be clear and concise. All relevant information must be shown in full on the drawings.

OTHER CONSIDERATIONS

The choice of site will be greatly facilitated by the use of aerial, topographic, and soil conservation maps. Careful study of these maps may reveal possible sites in areas previously considered unusable and may disclose drainage, sewage, subsoil, and water problems. Power companies should be asked to provide maps of power lines. The Highway Department can provide help not only in locating a school with regard to existing and projected new roads, but also in estimating costs for any new roads that may have to be built for the project.

School sites can no longer be viewed merely as a place to locate a building. Sites have more of a role in the total school and community picture than this and those selecting a site should consider the following before a final decision is made:

1. Will the site offer an opportunity for out-of-door educational activities?
2. Is the topography of the site such that there is ample room for recreational and physical education activities for the entire school enrollment?
3. Will the site provide opportunity for educating the students in the conservation of natural resources?
4. Can use be made of the site to provide means of educating children in ways of combatting pollution of our natural resources?
5. Is the site located favorably so it can be integrated for use with the community recreational activities and functions?

When definitive choice of the site has been made, boundaries must be accurately located before the actual purchase is made. Final acquisition of the land should be made only after all legal requirements for securing the site have been met. The deed of sale must be properly recorded. It is advisable to mark the corners of the boundaries with stone or some other durable and easily visible means, especially if adjacent land is to be purchased at a later date.

This brief survey of the multiple factors that must be considered when choosing a school site indicates that a school board or building committee would be well advised to obtain as much professional help as possible from lawyers, architects, engineers, and other qualified consultants, at all stages of the process.

Site evaluation worksheets may be found in the Appendix to help committees in choosing the best site.

CHAPTER VI - SCHOOL DESIGN AND CONSTRUCTION CONSIDERATIONS

School design is continuously changing and all who participate in the planning of a school building should keep abreast of the latest developments in the field. To ignore this fact may mean that the product of the planner's efforts can be outdated by the time it has been completed. The purpose of this chapter is to suggest the nature of some of the ever-changing conditions that influence school design and construction so that all those responsible for planning school plants will be alert to these conditions.

BACKGROUND

During the latter part of the 1950s, and especially after the first successful flights into space, the teaching of science was emphasized. Many schools of that time were constructed with large and sophisticated science laboratories and technical facilities. Currently, concern for the social and health problems of our society has caused a change in various aspects of school facilities. Reflecting this concern, buildings are being planned with conference and seminar rooms, lecture halls, and with many spaces devoted to panel and group discussions. Educational concepts will reflect change in the future and the wise planner will review, study, and evaluate conditions, hoping to design a building that will best meet the educational needs of the community. The "open-concept" schools and "action-learning" areas described in the chapter, Instructional Elements, are examples of new techniques and methods that are having significant influence on the design of schools.

RESEARCH

Industry invests millions of dollars each year in research seeking to improve methods, developing new products to meet new demands, and at times to create new demands. A similar effort, though somewhat less intense, is taking place in the field of school design. The Educational Facilities Laboratories has produced a number of comprehensive and influential studies of many aspects of school design. Those charged with the planning of buildings are encouraged to study and evaluate readily available reports from this and other reliable sources.

PRACTICES

The trends of today often become the accepted practice of tomorrow. As concepts change, it is important that consultants, designers and committees be sensitive to construction trends and practices and adopt those which show promise. For example, "modular" design and construction is not new, but the principle of the method is gaining wider acceptance. "Modular" design or construction means the repetitive use of an element of design. It may be the repetitive use of a "module" of space where a school is designed and constructed with a series of "bays", each having the same dimensions, or it may be the repetitive use of materials of standardized size. Manufacturers of building materials and components have widely accepted this concept. Windows, brick, plywood, tile, as well as many other items of materials and equipment are being produced in standardized "modules." It is important that the economies and advantages of this method of design and construction be discussed with the architect.

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Prefabricated and pre-assembled elements have also been used much more widely in recent years. For example, prefabricated wall sections incorporating durable exterior faces, effective insulated cores and attractive interior surfaces are readily available. Such units are manufactured off-site or constructed on the ground at the site and then "tilted" into a permanent vertical position. One of the major advantages of this type construction is the speed with which buildings can be erected.

The "systems approach" to construction is probably the most sophisticated of the new design developments. Such a method was used in this country to produce the automobile in mass quantities. Each component part is integrated with every other part to form a highly efficient whole. Such components as roof sections, ceiling systems, lighting, heating and ventilation, along with other standardized materials have been combined to produce the whole structure. To date the "systems approach" has been handicapped by the lack of volume to justify mass production of components. As our needs increase due to more students and newer learning methods the future may produce the volume of construction to justify the mass production lacking at present.

ECONOMICS IN SCHOOL CONSTRUCTION

It is easy to build an expensive school; it is almost as easy, by cutting corners and using low-grade materials, to build a cheap school. Building an economical school means obtaining the best possible facilities at the lowest possible cost. This requires thorough planning and meticulous attention to every detail of the construction process. An economical school will give satisfactory service over many years with a minimum of upkeep, will be expansible and flexible to meet future educational needs, and will represent a "good buy" for the school district.

It may be pertinent to quote the following statement by Mr. Harold B. Gores, President of Educational Facilities Laboratory, which appeared in the February 1970 issue of the New Hampshire School Boards Association Newsletter:

> "People need to know that the cost of a schoolhouse is only 6 percent of the total cost of conducting the school through the years of its normal life. Typically a million-dollar schoolhouse has an operating budget which totals about one million dollars every three years. Imputing a life of sixty years -- and most schools last that long -- the original cost of the building is only about 6 per cent of the total cost of running the place. As more people come to grasp this ratio in perspective, communities are relaxing about trying to 'save' money by cheapening the original cost of the structure."

In order to build an economical school, the committee must be guided by long-range considerations. Initial cost of materials must be balanced against possible low maintenance costs, durability, and insurance savings.

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For example, high-grade materials are more expensive at the outset, but may save thousands of dollars in maintenance over the years. Insurance charges will be considerably less for a building equipped with a sprinkler system, and constructed of fire-resistant materials. Heating costs will be lowered by adequate insulation. These are but a few instances of the savings that can be realized by a careful study of every component of the building. Some practical suggestions, both general and specific, for achieving economies are presented below. While no single one of these suggestions may save a great deal of money, the committee may realize substantial savings by using as many of them as possible.

Thorough planning is the basis for an economical building program. It is important to have sufficient time for a thorough study of each step in the building process and for the preparation of specifications, drawings, etc., by the consultants. In selecting an architect, the committee might employ a candidate who has a reputation for designing economical plants of good quality. Clear lines of communication must be maintained at all times between the architect, the school board, and the administrator. Changes, delays, and indecision result in additional costs. The architect and the other professionals involved should have a timetable for the project that will give them adequate time for programming, design, preparation of documents, etc., and provide for an orderly progression of events. As plans for the building take shape, the cost estimates should be reviewed periodically. The committee should study codes, regulations, and standards to consider the use of money-saving innovative methods.

There are several specific ways of economizing during the planning stage. The site should be appropriate for the development of an economical building; if land is expensive, a multi-story building on a smaller site might be more economical. If the enrollment projections forecast a substantial increase in the school population, it might be wise to consider over-building at the outset. The possibility of cooperation between several neighboring communities in planning and construction should be kept in mind. Choosing a time when contractors are not busy may result in lower bids and attract a larger number of bidders. Trends in interest rates should be watched, so that money for the project may be borrowed at most favorable rates.

In the design phase, there are several general considerations that will result in economies, such as overall simplicity in design, minimal use of exterior perimeter walls, and avoidance of large areas of glass. If several schools with similar requirements are to be constructed, it may be advantageous to use the same design for all of them. The concepts of modular planning, the use of prefabricated assemblies and other techniques discussed earlier in this section, should be considered. It is also important to select a structural system that will permit a quick closing-in of the job, especially in our New England climate. Inside the building, space arrangements should be designed for utmost efficiency, keeping the ratio of gross area to net functional square footage as low as possible; inefficient uses of space as in corridors, circulation space, lobbies, should be kept at a minimum. Wherever feasible, areas should be designed for multi-purpose use, but in keeping with the educational specifications. All mechanical, electrical, and plumbing systems should be easy

to control and maintain. If the concept of flexibility is incorporated into the original design, it will result in savings later, if changes have to be made in the structure.

In the preparation of the educational specifications, economies may also be effected by a careful study of the curriculum. Year-round utilization of school buildings for both school and community programs is encouraged, including some possible kinds of income-producing usage. The wide variety of movable equipment and furnishings available on today's market will necessitate close scrutiny by the committee in choosing the most economical items which will meet the educational specifications, especially if the "action" type of learning described in the following chapter is to be included in the curriculum.

Some general economy-promoting factors are flexible state and local standards and codes. In the area of bidding, all documents submitted to a contractor for bid should be complete, concise, accurate, and free of confusing language which might limit or discourage competition. Bidders should be allowed enough time to develop cost estimates and submit accurate bids.

REMODELING EXISTING BUILDINGS

The decision to renovate or remodel an existing school building must be based on a realistic evaluation of the facilities in the light of present requirements for education. Schools have a life expectancy of fifty to sixty years, and school board members and citizens are often reluctant to admit that the schools they attended are obsolete by today's standards. Some of these older schools have considerable aesthetic appeal, and most of them are symbols of tradition and permanency in the community. An evaluation study may evoke many nostalgic memories, but a realistic appraisal will show that these same schools are educationally and environmentally substandard, with small rooms, excessive glare from windows and lighting fixtures, and heating/ventilation dependent on steam radiators and the opening or closing of windows. Age alone is not the only factor in the evaluation of existing buildings; the actual physical condition of the structure and its remodeling potential are essential factors to be considered. Maintenance, neglect, upgrading of construction and educational standards all contribute to the obsolescence of a building. It is unrealistic to expect 20 to 30 years of additional life for a 40-year-old school without undertaking extensive repairs.

The evaluation of an older building is difficult due to the lack of any fixed scale or standard for measuring its future useful life span. Competent professional architects and engineers should be consulted by the committee to provide guidelines for an impartial analysis of the building that will conform to the needs and specifications of the district. One standard of measurement is cost: most educational consultants and architects agree that if the cost of renovation is 50 per cent or more of the cost of providing new space, it will be advisable to consider new construction.

CHAPTER VII - INSTRUCTIONAL ELEMENTS OF THE SCHOOL

The core of any educational facility is the area where learning takes place. This is where the student reacts to the stimuli of the educational environment; he interacts with other students during the learning process; he becomes actively involved in the process of directing his own learning. Learning spaces must be planned and developed on the basic premise of serving the student's learning needs; they must implement the educational specifications formulated earlier in the planning stage and provide enough flexibility to accommodate future changes in methods and procedure. Modern educational research and experience have indicated the desirability of certain changes in the organization of learning spaces. The traditional classroom no longer satisfactorily provides the flexibility and facilities necessary for self-instruction, team teaching, and nongraded programs. It is impossible to forecast accurately the evolution of the educational process; change is the only absolute of which school planners can be certain. New techniques of instruction, new equipment, new construction methods are being developed and tested on a continuing basis, but in a real sense the question of how to prepare adequately for change remains unanswered. School planners have the difficult task of choosing from a wide array of possibilities the types of learning spaces that will best meet the current and future educational needs of their district, while at the same time getting the most usable space for their dollar and minimizing obsolescence. The purpose of this chapter is to provide guidance for school planners in making decisions with regard to learning spaces. A brief description of the components of the learning process, the general implications of different types of activities for learning spaces, and some guidelines for creating separate and different kinds of learning spaces are presented here in an effort to fulfill this purpose.

The Learning Process

In spite of years of extensive research, study, and testing, no one has yet been able to devise a simple formula for the process whereby a human being absorbs knowledge. The problem has been approached from several viewpoints -- the environment, the teacher, and the student. The student-oriented approach seems to hold the most promise, since he is actively and individually involved in the learning process, which he must somehow synthesize and adapt to his own needs. There are three basic components in the student's learning process: "reaction," "interaction," and "action."

Reaction learning is the method that has been traditionally applied in most schools. Here someone (a teacher) or something (resource materials) outside the student is the initiating agent, and the student learns by reacting to this external stimulus. Some question has arisen as to the value of this form of learning; the results seem to show that it is a rather hit-or-miss method. Simply assigning a group of students to a lecture or class at

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a prescribed place and time and exposing them to some kind of information will not assure their retention of this information nor their ability to assimilate what they have retained. It is conceivable that reaction learning may in the future be confined to materials that are available when needed by the student, and that the role of the teacher in this aspect of the learning process may undergo considerable change.

Interaction learning involves the exchange of facts, ideas, and opinions with others. It is the only type of learning that requires a group setting, where the teacher becomes a fellow participant, acting as a discussion stimulator and resource person without dominating the proceedings. This is a difficult role for the teacher to execute successfully, and most teachers in today's schools have received little training in this method. However, the development and use of seminar-type classes and small discussion groups should be encouraged in order to promote the beneficial effects of interaction learning.

In action learning, the student learns by doing. Action learning is not only independent study, but occurs constantly as the student acquires intellectual, social, and physical skills. The setting may be a music practice room, science laboratory, machine shop, gymnasium, library or the home. A suitable environment is necessary for student-initiated action learning.

These three components of the learning process form the basis for planning instructional spaces. No one student will learn equally well by all these processes, and school planners should always bear in mind the individual needs of the persons the schools are designed to educate. The imposition of a rigid educational program may appear to facilitate the planners' task, but the purposes of education will be best served by providing each student with opportunity to pursue the learning process according to his own needs and abilities.

General Implications for Learning Spaces

The practical application of the theoretical aspects of the learning process outlined above will require that school planners determine the proportional distribution of learning spaces with regard to each part of the process.

Spaces for reaction learning must make provision for an adequate number of student spaces, and must be designed to permit convenient use of expository materials. Seating should be arranged for proper viewing of the speaker and of projected materials. Light control for projection purposes and for note taking should be prearranged so that the instructor's effort is minimized and continuity is assured in the presentation of material. Provision should be made for audio and visual forms of instruction according to the activity planned for the space.

Interaction learning requires a suitable setting for small groups without interference from the outside. Visual and sonic seclusion should be provided to increase concentration within the group. For a small group, the arrangement of space, equipment and furnishings should permit individuals to confront the other participants. Chalkboards and other auxiliary materials should be available.

Action learning requires a wide variety of spaces. Any action learning space must provide the thermal, visual, and sonic conditions necessary to protect the learner and to prevent his activities from interfering with those of other learners. For example, a student practicing the violin, a student involved in a physics experiment, a journalism student writing an editorial for the school paper -- each is carrying on a very different and incompatible learning activity which by its very nature will require a different environment. Spaces for action learning require a large quantity of specialized equipment and furnishings (libraries, laboratories, gymnasium, shop areas, etc.); provision must also be made for visual supervision of students in areas where dangerous equipment is in use; unlike the other types of learning areas, action learning spaces must fulfill stricter sanitation requirements -- showers, sinks, locker and storage rooms are necessities in gymnasiums and shop areas.

The basic space requirements for the reaction and interaction types of learning are essentially the same, regardless of the desired learning goals, although differences may exist in equipment and furnishings. For instance, a lecture on science will require the same sort of space as a lecture on literature; the same type of arrangement can be used for viewing a film on social studies or on machine shop; the audio requirements are the same for listening to a symphony or a political speech. The same holds true for learning spaces for interaction learning in small group discussions. Thus, the specific curricula organization of educational programs is not a significant factor in planning learning spaces for reaction and interaction learning.

Requirements for action learning spaces vary greatly according to the educational philosophy of the school system. In view of the cost of providing and equipping action learning spaces, school planners must be definite on educational goals to be achieved. This consideration applies to the planning of resource centers, laboratories, gymnasiums, etc.; it is especially important in the development of a vocational curriculum, where planners must resolve the crucial question of how to provide for basic needs while preserving a certain measure of flexibility to accommodate future changes.

Elementary Learning Spaces

The following description of elementary learning spaces includes three major areas: Kindergarten, the general elementary classroom, and the "open-concept" learning space.

Kindergarten

Kindergartens are highly desirable and are recommended by the State Board of Education. In view of the current trend toward early childhood education, it is expected that kindergartens will become a requirement in this state.

Kindergarten rooms should provide a minimum of 50 square feet per pupil; more space is recommended to provide increased opportunity for action learning. With a recommended limit of 20 pupils per group, the minimum size room would be 1000 square feet (1200 square feet is preferable).

The room should offer a relaxed, homelike environment to encourage children to live, work, and play together. Furniture and equipment should be child-oriented and child-sized; portable or movable furniture offers the advantage of permitting immediate and spontaneous changes in the learning situation. Flexible arrangements should be made for regrouping the children into small clusters or large groups; individual places should be provided for quiet, personal activities. Versatility and variety in the physical arrangements will maintain the pupil's interest and enthusiasm; it should be possible to alternate "noisy" activities with quiet periods; groups should be able to engage in outdoor activities under supervision while others work indoors.

Shelving in the kindergarten room can be varied -- some movable, some stationary, some recessed. Those units that are movable can be backed with tackboard, providing a very usable combination that can also serve as dividers or partitions within the learning unit. There should be a generous amount of chalkboards and tackboards, and it is important that the units be kept at the child's eye level.

Toilet facilities should be located within the room, with one toilet for each ten pupils. A large sink, with the hot water at tepid level, should be placed near the toilet area.

A drinking fountain, electrically cooled, should be planned within the room. It is very important that the bubbler be at a height convenient for the kindergarten child.

Sufficient electrical outlets will facilitate using audio-visual equipment, cooking experiences, etc.

Properly controlled heating and ventilation, adequate lighting, attractively painted, easily cleaned walls, plenty of storage areas, shelves, cubbyholes are all necessary elements for a suitable learning environment. Carpeting a section of the floor will enhance the homelike atmosphere, and acoustical surfaces on walls and ceiling will minimize noise. Each kindergarten should have an audio-visual area for listening activities, a game center, and individual carrels for independent work.

In general, the kindergarten should be designed with a view to stimulating a child's imagination. Simple, natural materials are preferable to complicated, ostentatious objects. The space as a whole should be challenging, provide freedom of movement for the restless, active child, and also permit the solitary child to pursue his activities uninterrupted.

The General Elementary Classroom

The classroom described here is the so-called "traditional" classroom currently in use in the majority of New Hampshire schools. Classroom size is an important factor in the learning process, whether the type of learning is reaction, interaction, or action. With greater emphasis placed on action learning today, it requires more space than the other two methods.

The minimum size for an elementary classroom should be 900 square feet. Though usually rectangular, classrooms can be designed in other shapes for the improvement of teaching and learning conditions.

Equipment and Furnishings: All classrooms should be equipped with adequate storage cabinets for instructional materials, books, and equipment. If no central teachers' room is available for storing personal belongings, clothes, etc., a wardrobe storage cabinet should be provided in the classroom. Other wardrobes can be placed in the classroom if needed, possibly using one side as a bulletin board or chalkboard. Shelving for books and counter space for work areas should be installed for most efficient service. In general, classroom furniture should be selected in accordance with the methods of teaching and learning to take place in the classroom.

The importance of a good visual and sonic environment for the learning process will be discussed in greater detail in a later section (see Chapter XII). The classroom should be attractively painted and should be well lighted with a combination of artificial and natural light. Window space should be determined in accordance with the educational and architectural specifications. Acoustical ceiling tile and floor carpeting will aid in control of noise. Actual treatment will vary with each room.

With the increasing use of visual aids, several conveniently located electrical outlets are necessary, and means for darkening the room must be provided.

Folding partitions or movable walls may be used between regular classrooms to provide space for large-group instruction. In general, movable equipment and teaching devices (audio-visual, movable demonstration tables, science equipment, etc.) are convenient to use and may be shared by several if sufficient funds are unavailable to provide each teacher with his own equipment and teaching aids.

The "Open Classroom"

Although the open-plan concept is at present applied more frequently in elementary than in secondary school construction, it offers certain advantages at all levels of instruction. In this type of school building, only the exterior walls and those enclosing highly specialized facilities are permanent and loadbearing. With clear span construction the entire floor space becomes one open area, which is then subdivided into smaller teaching areas by nonload-bearing walls. These interior walls may be movable or demountable; they may also be semipermanent, and their removal may involve minor construction work.

In the "open classroom" concept the school is divided into a number of open zones containing no fixed walls or seating arrangements. Learning spaces can be subdivided by cabinets, bookshelves, chalkboards, bulletin boards, and flexible partitions. All these room dividers will have casters or other means for easy movability. By the same token, most furniture and equipment in the open classroom will be movable.

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The visual environment will require more artificial lighting than the conventional classroom. Since there are few fixed interior partitions, the exterior walls will provide the only space where permanent teaching aids such as chalkboards and bulletin boards can be mounted, thus considerably reducing window space. Wall finishes should be carefully selected to cut down glare. Noise control is essential with the large open learning spaces of the open concept. Acoustical ceiling materials and floor carpeting help to create the proper conditions for learning.

Heat and ventilation control need thorough study, in view of the flexible space and pupil groupings characteristic of the open plan. Designers should also plan sufficient electrical outlets, storage cabinets, student wardrobes, etc.

A well organized and well stocked instructional materials center is the nucleus of the open school. Centrally located, it will contain not only an array of media equipment and materials to be distributed for group instruction, but also books and other reference materials to be used individually. The materials center will provide space for groups assigned to special work, as well as carrels for individual study. The instructional materials center replaces the concept of the traditional library/study hall and encourages interaction and action types of learning.

Although the open concept requires the rethinking of traditional methods of design and teaching and learning techniques, it offers many advantages for the learning process. School planners should consider incorporating some of the features of the open school into their design, possibly in combination with the more traditional methods of construction.

Elementary Science

The recommended minimum size for an elementary science learning area is 900 square feet. The same size is recommended for an intermediate science space.

This area should include the following features:

1. Student work counters around the periphery of the learning area, with storage space underneath for student use.
2. Appropriate movable tables throughout; one-third of the area should be left free of any furniture to provide for free-space science activities.
3. At least two sinks -- one smaller for water supply and one large clean-up sink per science area, preferably in a service island with storage space beneath. If the island contains electrical outlets, they should be placed to avoid the possibility of shock by contact with faucets or sinks.
4. One large wooden workbench with appropriate tools per science area.
5. Portable heat sources -- electric hot plates or gas cylinders.
6. Spaces for continuing experiments, display of students' exhibits, and/or written materials.

7. An electric outlet every six feet of counter space.
8. An area for biology-earth science, including wet and dry work areas.
9. An individual and/or small group instruction area and audio-visual center.
10. If possible, a plant-growing area outside as well as inside the building.

Secondary Instructional Spaces

As in the elementary grades, interaction and action methods of learning are being increasingly applied on the secondary level, necessitating more space in all instructional areas. For a general classroom, 900 square feet, including storage, are recommended to allow flexibility. If different wings or sections of the building are designated for related activities in specialized areas, the use of folding partitions is recommended in order to enlarge or reduce classroom sizes as desired for large-group instruction, team teaching, small seminars, and independent study.

The same requirements for a good visual, sonic, and thermal environment apply here as on the elementary level. Attractively painted walls with a minimum of glare, a good balance of artificial and natural lighting, acoustical materials on ceilings and floors for noise control, even heat and proper ventilation throughout the building will provide the physical surroundings most conducive to the learning process. Sufficient electrical outlets in convenient locations are a necessity. Provisions should be made for television, including closed circuit transmission as well as reception of commercial and educational programs, and it is recommended that each room have a permanent screen for showing film and filmstrips. The type of activity planned for each space will determine the number of storage and filing cabinets required.

Some specific recommendations for different classrooms according to subject matter are outlined in the following pages.

English

1. Furniture should be flexible in order to accommodate groups of various sizes.
2. Teaching stations or carrels should be available for individual work; sections of the room can be arranged to provide for a reference center, reading table, displays, individualized material kits, etc.
3. A small stage or platform for dramatics and public speaking activities could be provided in one or two rooms. A folding partition would screen these areas when not in use.
4. A large quantity of chalkboards and bulletin boards is a necessity.
5. Each room should have a tape recorder, record player, lectern, and unabridged dictionary with stand.
6. Enough projectors to serve the needs of the program should be provided, including the 16mm sound, filmstrip with slide attachment, overhead opaque and a video tape recorder on a shared basis.

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Social Studies

Most of the recommendations for the English classroom apply equally to the Social Studies classroom. In order to provide for different learning methods, the room should contain a variety of printed and audio-visual resources. Interaction and action types of learning should be encouraged by the physical arrangements and supported by the materials available.

1. Provision should be made for small group work and discussions, either in separate small rooms or in designated areas within a larger room.
2. The furniture should be movable to allow for a variety of working arrangements (different chair-desk combinations, tables for discussion, etc.). The different specifications will determine the number, size, and shape of tables, chairs, and other furnishings.

Reading

A reading center for teaching small groups up to ten students should have an area of 150-300 square feet. The following guidelines should be used in planning this facility:

1. Larger than usual storage space must be provided; diagnostic services and a program of corrective/remedial help demand a great variety of materials.
   a. Intensive phonics material, programmed material, periodicals, newspapers, multilevel instructional kits, and trade books should be available.
   b. The usual audio-visual materials, as well as a controlled reader, tachistoscope, permanent screen should be part of the equipment.
2. Good lighting is most important in this area.
3. Space should be provided for chalkboards and bulletin boards.
4. Aside from filing and storage cabinets, the furniture should consist of a suitable teacher's desk, desk-chair units or tables for ten to twelve students, with the possibility of arranging the furniture for large groups or routine developmental lessons.

In general, reading is best taught in its own setting. This area can be used by, and shared with, classes in mathematics, science, and social studies, utiiizing the reading center primarily for testing and remedial/corrective work in small groups.

A recent trend has been to locate this center in the library-resource area, where all the necessary materials, equipment, and supplies are readily available. In this case, provision for space and furniture, equipment and materials should be made for the reading center when planning the library-resource center. The advice of reading specialists will be valuable in determining the specific needs in this field.

Mathematics

Flexible design is recommended for the mathematics area, to permit both large and small group instruction. If an experimental approach is employed,

such as the "lab" type of instruction, tables, instead of desks, might be used. At least one larger area of 1200 square feet (instead of the usual 900) should be provided for such a program.

In a large school, a special work area for mathematics teachers similar to a seminar room could be designed with a math carrel for each teacher, library shelving for refererence materials, filing and storage cabinets, etc. In a smaller school, this area could be shared with other departments.

The other requirements for furniture, equipment, and materials are similar to those for English and social studies.

Science

The development and application of interaction and action types of learning are particularly evident in the field of science. Individuals and small groups are using problem-solving approaches and techniques in laboratory work. There are more student-teacher planned experiments and fewer laboratory-manual experiments. As a result, the requirements for space design and equipment have undergone important changes, with flexibility and the increased use of audio-visual and other aids being stressed.

Since science equipment usually represents an expensive investment, careful consideration must be given to all factors involved in order to insure maximum flexibility with the most efficient utilization of space:

1. Plumbing and electrical fixtures should be grouped for economy.
2. Special wiring for 220-volt outlets and possibly a converter to direct current should be planned.
3. Location of work tables to obtain the most favorable light (southern exposure is recommended for general science and biology).
4. Efficient ventilation for the laboratories. A fume hood over special areas may be necessary to supplement the regular ventilation system, and a separate ventilator duct should be installed for the storage-preparation area.

Junior High School Science Area

1. Floor space for a laboratory should be 1000 square feet, including adjacent storage and preparation space, per daily 250 minutes of science class occupancy. An elaborate laboratory is NOT required.
2. Student stations at counters on three sides.
3. Two student movable tables.
4. Counters containing sinks, electricity, gas.
5. Removable equipment supports in both counters and tables.
6. One chemical hood, stationary or portable.
7. One large clean-up sink in student space.
8. One 16-foot ceiling beam with open space below for suspension activities.
9. Provision for the following:
   a. Plant and animal growth area.
   b. Rough-handling surfaces for geology.

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c. An aquarium.
d. A darkroom or equivalent.
e. A science-reference, study, report-preparation area with audio-visual instruction aids.

Biology

Recommended area: minimum of 1200 square feet; if special areas, such as plant-growing racks or a greenhouse, are planned, more space will be required. This unit should be designed for efficient housekeeping -- floors, tables, walls, and equipment should be water-resistant and easily cleaned. Extra illumination will be needed for such activities as dissection, and auxiliary lighting should be provided for special areas for plant and animal growth.

The following specific features are recommended:

1. Special items of equipment -- refrigerator, pressure cookers, autoclaves, units for cooking and drying, incubators, AC/DC supply units, aquaria and terraria, microscopes -- depending on the type of program to be offered.
2. Space for raising and experimenting with terrestrial and aquatic plants and animals. Special environmental controls, separate from the other parts of the building, are needed for these areas.
3. Adequate sources of water, the use of impervious materials, floor drains, special storage areas will contribute to good housekeeping.

Physics

1. Recommended area: minimum of 1200 square feet, not including special preparation and storage spaces.
2. Two student station units at least six feet long (for motion work), with removable supports for class and experiment work, gas and electric outlets.
3. Counters on three sides of the room with sinks, gas, and electricity, and storage space beneath.
4. Means for completely darkening at least one physics room.
5. Two 16-foot suspension beams, one across front of room and the other down the center with open spaces beneath.
6. Sources of DC current from portable units.
7. Electricity-electronics workbench for student-teacher experiments, equipment building, and maintenance.
8. Locked storage for sensitive, specialized equipment, and for radiation sources and toxic chemicals.
9. Possibility of utilizing sunlight by correct location of room.
10. A darkroom for student use.
11. Space for long-term experiments and project work.
12. Overhead projector for student use of acetates to present solutions to physics problems, reducing need for extensive blackboard space.

Chemistry

1. Recommended area: minimum of 1200 square feet, not including special preparation and storage spaces. The combined laboratory-classroom may be replaced by a three-room suite with laboratories on either side of a tiered instruction space.
2. Fume hoods: at least one glass-sided hood, 60" x 30", accessible from both sides. If more than one chemistry laboratory is planned, one could be equipped with hoods; if a suite is planned, the instruction space will need one 48" hood.
3. Specialized storage and handling procedures for the following:
   a. Corrosive chemicals.
   b. Toxic chemicals.
   c. Radioisotopes.
   d. Combustible chemicals.
4. Ample storage for glassware and prepared liquid reagents, with separate distribution shelving.
5. Areas for weighing, specialized instruments, long-term experiments and project work, glass working and apparatus fabrication, reference library.
6. Sources of DC current from portable units for electrochemical work.
7. Easily accessible safety showers and eye washes. If these are to serve more than one laboratory, they should be centrally located.
8. Noncorrosive pipe in all waste lines.

Foreign Languages

Classrooms for foreign language study have the same space and equipment requirements as regular classrooms. The extent of the facilities in this area will depend on the number of students and the curriculum to be offered. If several languages are to be taught, it might be advantageous to plan some smaller seminar rooms for small group instruction.

In addition to the classroom, most secondary schools are utilizing language laboratories to offer the student more extensive practice in listening, comprehension, and speaking. Two different basic types of laboratory facilities are available for teaching foreign languages: the philosophy of the department will determine whether only one or a combination is to be used. One type of language laboratory consists of an electronically equipped classroom, where ordinary students' desks will have a microphone and earphones, with a taped program supplied from the teacher's console. An advantage of this laboratory is that the classroom can be easily reconverted for conventional methods of instruction by removing and storing the electronic equipment. The fixed laboratory requires a separate room with permanent installations. Students sit in semiprivate listening booths which are equipped with earphones; individual tape decks enable them to change their own taped programs. Tape decks may also be located in the teacher control console, which may be

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either on a raised platform to the rear of the desk-cabinet area or in a separate glass-walled booth providing visual contact between student and teacher. This type of laboratory should be located between two classrooms and contain a maximum of twenty-five listening stations.

An adjacent work-storage area must be provided for all language laboratories. This area must be soundproofed to permit the preparation of tape programs and must have special ventilation due to the heat generated by electronic equipment. By the same token, special provision for ventilation may be necessary throughout the laboratory area. A single switch should turn off all electronic equipment in the laboratory except the overhead lights. In designing the laboratory area, care must be taken to prevent interference with or damage to magnetic tapes and other electronic equipment by fluorescent lamps and other electrical fixtures.

Art

Since students will be working with a wide variety of tools and materials, the art room must provide more space per pupil than the listen-recite classrooms. At least 50 square feet of working space per student should be provided. Approximately 60 square feet per student will be required if storage and display space is included. Some space savings are possible by combining work surfaces with storage units.

The art room should be centrally located along the main traffic lanes. The visual environment should provide balanced lighting conditions, reducing the difference in brightness between the work and the surroundings; light matte painted walls will help achieve this effect. The art room may be a rather noisy place, and the sounds of constructing, carving, turning, sawing, or hammering should not be permitted to disturb other school areas. Acoustical treatment for walls, floors, and ceiling should be designed with this fact in mind.

A diversified art program needs adequate facilities for work and storage. In general, drawing boards, easels, paints, brushes, and papers of various sizes (including 24" x 36") will be required and should be easily accessible. More specialized activities will have additional requirements for equipment and storage. Work in pottery and clay, for example, calls for a kiln connected to a 220-volt circuit, as well as space for drying. Similarly, carving, sculpturing, weaving, block and screen printing, lithography have particular requirements. Planners, keeping mind that a good art program will give the students as many opportunities as possible to develop their natural creative talents, should draw up the educational specifications in this field accordingly.

In the overall arrangement of the art area, a walk-in storage room opening from the main room should be provided. Other items needed are one floor-to-ceiling wall of tackboard, at least 30 square feet of chalkboard, and large trash cans that can be rolled out of sight under the counter tops. The furniture should include the following:

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Teacher's desk.
Cabinet for paper.
Cabinets for wet-clay storage.
Cabinets for storage of paper, textiles, weaving materials, and student work in progress.
Cabinets for storage of brusnes, paints, ink, clay tools, and illustrative materials.
Sink and cabinet.
Student tables and chairs.
Bookcase.
Metalcraft bench materials, tools, and work storage.
Wood bench materials, tools, and work storage.
For pottery work: clay bin, spray booth, kiln (sized according to scope of program).

In summary, a well-organized art room will provide maximum effective work time for the student; an attractive art room can provide aesthetic stimulation; and an orderly, uncluttered art room is essential for effective learning.

Music

The major emphasis in this field includes individual and group performance in both instrumental and vocal music. The groups may vary in size from small ensembles to large choirs and bands. These varied activities require four essentially different kinds of learning spaces:

Large group choral spaces.
Large group instrumental spaces.
Practice spaces for individuals and small groups.
General learning spaces.

The scope of the music program offered and the projected student enrollment will determine the extent of the spaces necessary. A single all-purpose room may be planned to fulfill most of the space requirements, accommodating vocal and instrumental rehearsals, ensembles, storage, etc. This should be designed for future expansion; most large schools will find it advantageous at the outset to plan separate areas for instrumental and vocal groups.

The question of risers will involve a decision on the part of the committee: should they be fixed (taking up valuable floor space) or movable (telescoping), or should they be purchased at all? If risers are decided upon, should they be purchased for the band (space-consuming) or would choral risers be preferable to accommodate a larger number of students (also requiring less room)? All the alternatives should be weighed in relation to the program being offered.

Practice rooms are a necessity, especially for students who play large instruments and have difficulty transporting them. Practice rooms should be located near both the instrumental rehearsal area and the equipment storage facility.

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Conveniently located office and storage spaces should be planned for the music area. Music sheets, books, uniforms, robes, and other equipment should be stored in specially constructed cabinets or lockers where they are to be used. Specially designed lockers are necessary for instrument storage (lined with soft material for uncased instruments). These lockers, as well as those for uniform storage, should have compartments that can be locked separately.

Although general activity spaces can be used for music classes in appreciation theory, and arranging, it is recommended that the music area be located in an isolated section of the school. Good lighting is important, and soundproofing is essential throughout the area.

Educational Television and Audio-Visual Equipment

When planning new school construction, committees should be cognizant of the role of educational television and the use of audio-visual materials and equipment in the newer teaching methods. New construction of school facilities should be designed with television outlets in each instructional area. The system might be an adjunct of a community cable system or the school may have its own system with a common antenna to service the whole building. There should be sufficient numbers of sets available in the school to provide for the estimated needs of the staff as determined by the program.

While audio-visual materials and equipment have been available for many years, their use and development has tremendously increased their potential in the learning process. Each room should have sufficient electrical outlets for the operation of several pieces of equipment at one time. Shades should be provided to darken the room unless other methods are available to make possible the presentation of films and strips.

Modern technology now provides teaching materials and equipment that can be used in all subject areas. The educational specifications must provide the guidance to the designer if each classroom is to be equipped with the necessary outlets, etc., for maximum use of these materials in the individual classroom, or if there is to be a centralized location for the presentation of such material.

The newer concept of the instructional material center, or library, is just one illustration of the advances made in the use of television and audio-visual presentations. This type of equipment can greatly enhance and strengthen the process of learning.

Library -- Instructional Materials Center

This section contains general guidelines for the library-resource center with regard to environment, location, space allotments, and equipment. Schools with strong programs in individualized learning or experimental teaching methods may wish to go beyond these basic recommendations.

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The instructional materials center environment is functional in design and inviting in appearance. Good lighting, acoustical treatment, and temperature and humidity control all contribute in creating this environment. Floor carpeting or some other noise-reducing material is recommended to enhance appearance as well as to improve the sonic environment.

The center should be in a quiet part of the building and be easily accessible. If the media center can be opened without opening the entire school, it will be easier to offer extended hours of service, enabling students to make fuller use of the center's resources.

A single instructional materials center may be sufficient for many elementary and secondary schools. There are, however, several factors which may necessitate additional spaces or a different arrangement of spaces. In large schools or in schools where the projected number of simultaneous users of the center exceeds 100, the media center should be subdivided into smaller areas according to subject, grade level or other organizational patterns in line with the school's educational philosophy. Extensive use of innovative programs will require a similar arrangement. Another solution is the establishment of subsidiary resource centers in other parts of the school, usually by subject area. For example, the recommendations for the science classroom include the installation of a reference corner for the convenience of the students. More extensive research or long-range projects would involve the use of the instructional materials center, but easily accessible reference materials are a necessity for the student's daily work.

Regardless of which solution is adopted by the committee, the instructional materials center should provide the following specialized spaces:

1. Individual study carrels. These carrels may be equipped with the most sophisticated electronic teaching aids from filmstrip viewers to an automatic electronic retrieval system (called "wet" carrels), or they may simply provide a quiet place for individual study or writing (called "dry" carrels). The number of carrels and the proportion of "wet" to "dry" carrels will be determined by the school's program and by financial considerations.

2. Group Study Spaces. The traditional table and chair of the library is being replaced by informal lounge settings with low tables for unstructured discussions and by the seminar facility for more organized small-group instruction. Tables, chairs, and audio-visual equipment should be chosen with a view to promoting group discussions.

3. A Listening and Viewing Area. This space should be set aside for the utilization of the instructional materials center's audio-visual resources. There must be a means of darkening the room, soundproofing, a fixed screen, teacher's desk, and comfortable seating for the students.

4. Material Storage and Display. All materials and equipment should be stored in properly designed spaces, easily accessible to the student for classroom or home use. The building plans must make provision for storing and displaying bound volumes, current periodicals, reference books, and other materials.

5. The Card Catalogue. This index of the available materials is vitally important both for the user and for the librarian and should be centrally located and visible to the librarian.

6. The Circulation Desk. This should be in a general location near the card catalogue and offer sufficient space for the staff.

7. Space for the Librarian and Staff. This should include office, work and storage facilities for the instructional materials center personnel.

Practical -- Industrial Arts

The Practical-Industrial Arts course offerings fall into three categories: general shop, business, and home economics. These courses, open to all secondary students, provide general background and basic training in the three fields. Vocational education as a preparation for careers in specialized areas is a distinct instructional unit and will be discussed in the next section of this chapter.

General Shop

The function of the general shop is to provide reasonably adequate facilities in a wide variety of industrial arts such as woodwork, metalwork, welding, electricity and radio, machine shop and drafting to enable students to become familiar with each subject. The general shop should be a large area with extensive storage space. It should be on the ground floor or in a separate building with access to service drives, and in a part of the school where the noise of shop activities will not interfere with other student activities. At least one overhead door not less than twelve feet wide and high enough for car or truck clearance should be provided.

The following space allotments are recommended as guidelines for the amount of space needed for a "heavy shop":

Type of Shop	Sq.Ft./Pupil	Sq.Ft. of Open Shop Area
Minimum	75	1800
Adequate	100	2400
Desirable	125	3000

The following criteria for shop design should be observed:

1. Shop rooms should be conveniently located for adult or evening classes (not in a basement area). Adequate natural lighting and a grade entrance for vehicles are very important.

2. The open shop area should be rectangular.

3. The shop ceiling should be at least 12 feet high (14 feet is preferable).

4. Partitions should be nonbearing curtain walls containing no mechanical or utility fixtures.

5. Continuous fenestration along the entire outside walls will provide natural light and facilitate future expansion.

6. The shop instructor should have his headquarters or office space in the open shop area where he will have a full view of the working area.

7. Adjustable shelving should be installed in the cabinets and storage areas.

8. Lockers for storage of shop clothes (double tier type lockers are recommended) should be conveniently located directly in the shop or close to it.

9. The electrical supply system for the shop must be carefully designed. Uniform coverage for movable shop equipment must be supplied with electrical outlets in most of the shop area. One duplex outlet for every 10 feet of wall space should be satisfactory.

10. All power and light controls should be centralized in a locked master control panel near the instructor's office or desk. A master switch should be installed to turn off all equipment simultaneously.

11. Equipment and work stations should be arranged to prevent interference.

12. There should be a safety zone of at least 3 feet between all machines.

13. Unless a separate classroom is set aside for shop classes, the shop should contain an area for open class discussion, equipped with tablet arm chairs and a ten-foot section of chalkboard.

14. The operation level of equipment should be set at the average elbow height of the students.

15. Wall benches 28" wide with heavy wooden tops (1 1/2"--1 3/4" thick), covered with 10-gauge steel plate are required for automotive, machine, and metal work. Benches for electrical work should be similarly constructed but not covered with steel plate.

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16. The hand-washing sink should accommodate four or more faucets and should be equipped with hot water.

17. The drinking fountain should not be a part of the hand-washing sink and must meet State Board of Health requirements. (see Chapter XII).

18. The welding area must offer special facilities for ventilation and curtain protection.

More than in any other part of the school, safety considerations in a shop area must be given equal importance with educational objectives. Adequate lighting and ventilation, master controls for all machinery, safety zones, and provision for constant supervision of the whole work area are absolute necessities in the shop room.

General Business Education

This program is offered to students who wish to develop competency in general business subjects. The activities may take place in one large room or in separate areas, such as a typing room, a bookkeeping room, and a shorthand room.

The space requirements, furnishings, and equipment will vary according to the scope of the program offered by the school. Specific recommendations will be found in the appropriate section under "Vocational Education" and may be adapted for the purposes of a general business course. The specific space requirements will be found in Chapter VIII, ("Standards for Instructional Spaces").

Home Economics

The objectives of a nonvocational home economics course are to train students in skills necessary for a successful home life, to develop a concern for the welfare of others, and to offer a basic orientation in the work skills required by jobs in this field. Several related learning spaces with different equipment are necessary to fulfill these objectives. The home economics area should be on the first or ground floor to facilitate delivery service, waste removal and accessibility. The size of the area will be determined by the amount and type of equipment to be provided and by the expected enrollment.

The following recommendations may serve as guidelines for planners:

1. Foods Laboratory

   a. Area should be 1200-1400 square feet.
   b. 4-6 unit kitchens should be installed, each containing 9 linear feet of working space in addition to range top; 12-15 square feet of base cabinets; 7-9 square feet of wall cabinets.
   c. General storage for equipment, aprons, food, teaching materials, supplies, students' books, etc., should be provided in 9-11 linear foot wall-to-ceiling cabinets.

d. Ten linear feet should be available for chalkboard, tackboard, books and reference materials.
e. Furniture should consist of 6 small tables (36" x 40"), 24 chairs, refrigerator-freezer combination, washer and dryer, dishwasher, and at least one garbage disposal, as well as a desk, file, and personal storage space for the teacher.
f. Ventilation must be provided to eliminate cooking odors.

2. Clothing Laboratory

a. Area should be 1200-1400 square feet.
b. 32 linear feet of floor-to-ceiling storage should be provided to accommodate the following:
   100 tote trays
   2 wardrobe cabinets
   2 cabinets for pressing equipment
   General storage space for sewing equipment
c. Wall space should be provided for chalkboards and tackboards.
d. A dressing room with triple mirror.
e. A good grooming center.
f. General storage for instructional materials, books, etc.
g. Furniture should include the following:
   9-12 sewing machines
   All-purpose tables (trapezoidal type) and chairs for 20 students.
   A desk, file, and personal storage space for the teacher.

3. Discussion and Demonstration Area

a. Space for 20-25 students.
b. Flexible seating arrangements.
c. Storage for audio-visual equipment and teaching materials in a floor-to-ceiling cabinet of at least 4-8 linear feet.
d. Space for exhibits.
e. Tackboard and chalkboard.

Vocational Education

The field of vocational education is undergoing constant evolutionary change. Formerly accorded stepchild treatment in the planning of school facilities, vocational education today is recognized as one of the prime responsibilities of a public system of education. In view of the fact that about 50 per cent of present-day high school students do not continue their education beyond the twelfth grade, there has been a growing awareness that the needs of these students would be better met by providing them with an opportunity not only for the acquisition of academic knowledge in intellectual disciplines, but also for training in specific job skills which would enable them to perform satisfactorily in the occupation of their choice. This section will present some guidelines for the three main categories of vocational education: shop; business and office occupations; and occupational home economics. If school planners are considering the implementation of a complete vocational education program, they are advised to use the consultant services of the Technical Vocational Division of the State Department of Education.

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Shop Areas

At present the general shop (see discussion preceding) is most commonly found in New Hampshire's secondary schools; a more complete vocational training program can include such specialized offerings as machine shop, electronics, metals, power mechanics, printing, woodwork, general farming, etc. The scope of the program to be offered will determine the extent of the spaces required; these spaces should make provision not only for action learning, but also for reaction and interaction learning. General classrooms and areas for small and large group discussions are as necessary in vocational education as in the general academic program. Flexibility and adaptability should be incorporated in the initial design of the shop area, especially since considerable cost and inconvenience may be involved in changing the physical arrangement of the shop spaces to provide for future changes in the program.

In addition to the general requirements for planning any learning area, the shop should include the following:

1. Washing facilities, toilets, and lockers located within the shop area, if possible.
2. Special lighting for such activities as drafting.
3. Reference materials within the shop area in a convenient, easily accessible location.
4. Electric grounding and safety switches for every machine, as well as several master switches in different parts of the shop to shut off power in case of emergency.
5. Vacuum systems and dust collectors.
6. Flooring: Wood floors for woodworking areas.
   Concrete floors for welding shops, auto mechanics, and machine shops.
   Resilient tile floors for drafting rooms and electronics laboratories.
7. Storage and auxiliary rooms:
   a. The size and location of the storage area is determined by the type of shop program. In general, each shop should have its own tool and storage space. Extensive storage will be needed especially for lumber, iron and automotive supplies. Provision should be made for easy unloading of bulky supplies.
   b. A refinishing room for woodworking projects should be included in the general shop area. Special provisions should be made for proper ventilation when spray painting, and to keep the room dust free.
   c. A classroom should be located adjacent to the general shop area and can be shared with other programs. If used only for shop instruction, it could be smaller than the general classroom, since shop classes are generally small. By installing tables or workbenches and providing extra illumination, this room can also be used for drafting. Conditions of maximum safety must be provided in all parts of the shop area.

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Space requirements for specialized shop areas will be found in Chapter VIII ("Standards for Instructional Spaces"). Listed here are the requirements for Vocational Agricultural Facilities, since these will necessitate the provision of areas outside the school building. If this course is to be offered, school planners should take this into consideration in the early planning stages, before proceeding to site selection.

Vocational Agriculture

The size of the shop facilities will be determined by the extent of the program. Agricultural-mechanics, forestry, and production-agriculture require 150-200 square feet per student; horticultural mechanics requires 75-100 square feet per student; agricultural-supplies or agricultural-products does not need a shop area, but requires laboratory space of approximately 50 square feet per student.

A horticulture program has the following special requirements:

1. An all-year greenhouse with a minimum of 1000 square feet of growing area and 500 square feet of "head house" for soil and plant preparation.
2. One acre of tillable land near the school is required; a minimum of three acres is recommended.

A forestry program has the following special requirements:

1. A classroom.
2. A shop similar to an agricultural-mechanics shop with 150-200 square feet of space per student.
3. A 25-acre tract of representative forest land is a minimum requirement; 50 acres are recommended.

Business Education and Office Occupations

Vocational business education prepares the student for a variety of office procedures -- typing, stenography, accounting, data processing, communications, general clerical work, etc. Marketing-management retailing also comes under business education.

Office Occupations

This program calls for a combination of classroom and laboratory learning experiences. Requirements are given for the general classroom, which incorporates some laboratory features, and for the more specialized areas.

Classroom

1. Area of 1200 square feet (50 square feet per student for 24 students).
2. Electrical outlets on each wall and a double electrical outlet for each secretarial desk, with a master switch to control all electrical outlets for typewriters.
3. Candle power at desk level of 50 to 75.
4. Acoustical ceiling and soundproofing floor covering (carpeting).

5. Furniture and equipment: secretarial desks, electric typewriters, adding machines, duplicators, transcribers, electronic wireless learning equipment, chalkboard, tackboard, visual aid panel for liquid markers, magnets, and white color projection surface.
6. Storage: work counter with cabinets beneath.
7. Auxiliary space: a self-contained room with audio-visual equipment and resource materials, adjustable posture chairs.
8. A sink.

Typewriting Laboratory

1. Area of 1200 square feet (40 square feet per student for 30 students.
2. Aisle space to each desk.
3. Electrical outlets as above for classroom, including master switch.
4. 50 candlepower lighting.
5. Furniture and equipment: adjustable typewriting desks and posture chairs, overhead projection equipment, chalkboard, tackboard, visual aid panel, electronic wireless learning equipment.
6. A work counter with storage cabinets beneath.
7. A sink.

Stenographic Laboratory Combined with Advanced Typewriting Laboratory

1. Area of 1000 square feet (40 square feet per student for 25 students).
2. Other requirements are the same as for the typewriting laboratory, except that L-shaped desks are recommended, and access to duplicating equipment and the adding machines area should be provided.

Bookkeeping and Shorthand

These two subjects may be taught in the same room or in separate rooms. Whichever method is adopted, a general classroom of 1000 square feet (or 40 square feet per student) is necessary for instruction in nonskill business subjects.

The bookkeeping room and the shorthand room have the following requirements in common:

1. Area of 1000 square feet (40 square feet per student for 25 students).
2. Aisle space to each desk.
3. 50 candlepower lighting.
4. Chalkboard, tackboard, visual aid panel.
5. Electrical outlets for audio-visual equipment (bookkeeping needs extra outlets for adding machines).
6. Work counter with storage space beneath.

In addition, typewriters in a nearby room must be available in the shorthand course for transcribing.

Marketing-Management Retailing (Distribution)

The laboratory classroom concept applies to this program and Office Occupations. The total area should be 1200 square feet (60 square feet per student

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for 20 students) and rectangular. Provision should be made for the following:

1. A display window area opening into the hall.
2. Portable display units.
3. Model store units.
4. Electrical outlets on each wall and portable lighting units with rheostat control for display purposes.
5. A three-way mirror unit.
6. A work-storage area, including a sink and providing adequate space for the storage of display materials, merchandise, and student materials. Cabinets that can be locked are recommended here.
7. All fixtures such as counters, wall-shelving, etc., should be flexible, portable, and simple.
8. Office or desk space for a coordinator should permit supervision both of classroom and of the work-storage area.
9. The room should be self-contained, including a wash basin, audio-visual equipment, and reference materials in current use.

Occupational Home Economics

The purpose of this program is to provide training in the skills necessary for a career in Child Care Services, Food Services, and Hotel-Motel fields. The program will be most effective and relevant if planned on the basis of local employment opportunities. The results of the analysis will largely determine the types of facilities and equipment required.

The following list of space divisions with the area necessary for each can serve as guidelines for planning:

Child Care	Sq. Ft. of Area	
	Indoors	Outdoors
Outside play area adjacent to indoor area and on the same level		2,400
Inside Nursery School play area, first floor preferred. 35 sq. ft. minimum per child, excluding storage, food preparation, and toilet areas.	1,200	
Observation room with a shelf and a one-way mirror permitting full view of the nursery school	300-750	
Classroom space separate from nursery school	600-800	
Toilet area: 1 toilet and 1 lavatory per 8 children, providing privacy, child-size fixtures	150	

Isolation area (for sick children)	50	
Kitchen area	200	
Storage and office space (unless part of a centralized warehouse and offices)	300-450	
Total Area Inside	2,800-3,600	
Outside		2,400

Food Service	Sq. Ft. of Area
Foods laboratory (work stations for 10-15 students)	1,400
Dining area or faculty dining room for approximately 40 persons at 14-16 sq. ft. per person (may also serve part time as classroom area)	600
(Dry) storage of food supplies	200
Student locker room (girls) for approximately 25 students, with rest room, shower, lavatory	300
Student locker room (boys) if necessary. Same as above	300
Related classrooms (for two-year program or large enrollment)	700 each
Total area	3,540

Hotel-Motel Aides	
Hotel-Motel - simulated actual room	1,000
Bathroom area	40-48
Classroom	600-800
Storage and office	300-450
Total Area	1,940-2,300

Physical Education

The purpose of a physical education program is to improve the students' physical well-being and to develop skills in team and individual sports. Although some forms of reaction and interaction learning take place in physical education, the major emphasis is on action learning whether in sports or in general conditioning and coordinating exercises. As pointed out earlier in

this chapter, any program chiefly based on action learning techniques will have extensive space requirements, and this holds true for physical education. There are four types of spaces needed for this program: gymnasium, corrective exercise laboratories, locker rooms and showers, and office and storage facilities.

Gymnasium

The gymnasium should be a large, well-ventilated, and well-lighted space, whose exact dimensions will be determined by the type of program to be offered. The most frequent activities in the gymnasium are sports like basketball, volleyball, badminton, trampoline, as well as various conditioning courses for the development of motor skills. Although this area should not be designed to serve a single sport such as basketball, planners may find it useful to know the minimum dimensions for a regulation basketball court for different age groups.

Junior High	42' x 74'
Senior High	50' x 84'
Maximum (mainly at college level)	50' x 94'

Bleacher space for spectators should be provided in accordance with community interest; if interscholastic sports are a part of the program, more seating capacity will be necessary than for a strictly intramural program. The bleachers should at no time encroach upon the floor area used for the learning activities; folding bleachers should be considered. At least three to six feet should separate the playing floor and the first row of bleachers or seating.

The activity area of the gymnasium should be free of obstructions such as pilasters, ventilating ducts, pipes, radiators, water fountains, etc. If desired, folding doors or nets may be installed to divide the gymnasium into smaller teaching areas. Requirements for ceiling height vary according to the size of the gymnasium and the activities planned for the program. It is desirable to have a minimum height of twenty-one feet from the floor to the lowest part of the ceiling or joists. The floor should not be slippery, and should have the necessary lines for courts and other game areas marked on it. Extra protection in the form of a heavy wire guard is necessary for windows, lighting fixtures, and thermostats if they are located where they might be damaged by game activities. The level of the lighting is given in Chapter XII.

Corrective Exercise Laboratories

Newer concepts in physical education call for "corrective exercise" rooms and other small-group activity spaces. These areas can be used for group games, wrestling, gymnastics, corrective physical therapy, etc. Space for these activities can be provided either by dividers in the gymnasium or in separate rooms. In the latter case, the area should be on the same level as the gymnasium to facilitate supervision and administration; the spaces have similar construction requirements as the gymnasium except that the ceilings need not be as high.

Locker Rooms and Showers

These facilities are strongly recommended for elementary schools, especially if the gymnasium is to be made available for community use. Lockers and showers in the physical education area are required for secondary schools and should be readily accessible for both indoor and outdoor activity areas. The rooms should be adequately lighted and well ventilated.

Of the many methods for handling clothing in locker rooms, probably the most satisfactory is to provide sufficient lockers for street clothing for the largest number of users expected at one time. In addition, one small locker for sports clothing should be provided for each student in the physical education program.

The showers should be near the lockers with a drying area between the shower and locker spaces. A towel room should open into this drying area. For larger installations, shower rooms should have entrances separated from exits. Gang showers are suitable for boys, and gang showers with several private showers near the entrance are generally acceptable for girls. Mixing valves with automatic water temperature control are recommended.

The floors throughout the area should be covered with nonslip ceramic tile or other impervious material (bare concrete is not recommended for shower rooms). Shower and drying room floors should be sloped so that water will run into floor drains along the walls rather than into a centrally located drain. The walls should be of glazed tile or an easily cleaned, nonabrasive surface. The traffic patterns laid out for these spaces should avoid, inasmuch as possible, the mixing of "shoe" and "barefoot" traffic.

Locker rooms should be planned to include water fountains or bubblers and mirrors.

Office and Storage Facilities

Offices should be provided for physical education instructors of each sex in a location which will permit supervision of both learning spaces and the locker, shower, and dressing rooms. The offices should have a private lavatory, toilet, and shower.

Equipment and apparatus storage spaces should also be near the instructors' offices and easily accessible to the learning area. The size of the storage spaces will be determined by the scope of the program; if the gymnasium is also to be used as an auditorium, adequate storage space should be available at floor level for folding chairs. Double doors without thresholds or fixed upright mullions are recommended to facilitate the moving of large equipment.

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CHAPTER VIII - STANDARDS FOR INSTRUCTIONAL SPACE*

Instructional spaces and/or classroom size are calculated on the basis of the educational specifications (see Chapter IV of this Guide) determined early in the planning phase of the building program.

To obtain approval of the plans and specifications of the project by the New Hampshire State Board of Education as required by RSA 198:15c, the applicant district shall provide sufficient data and other pertinent information to show that the educational specifications will be met. The Castaldi Nomogram is a reliable method for determining the number of teaching stations needed in the facility.

EXCEPT WHERE CONSTRUCTION CALLS FOR FIXED OR PERMANENT INTERIOR PARTITIONS, APPROVAL OF THE SIZE OF CLASSROOMS OR INSTRUCTIONAL SPACES WILL BE DETERMINED BY AN ACCEPTABLE NUMBER OF SQUARE FEET PER STUDENT MULTIPLIED BY THE TOTAL PROJECTED NUMBER OF THE CLASS OR GROUP. It is, however, strongly recommended that school planners make provision for more space than the "acceptable" minimum required. In order to provide flexibility and to facilitate the accommodation of increased pupil enrollment and program growth, a recommended number of square feet per student is also given. It is hoped that committees will give serious consideration to this suggestion.

STANDARDS FOR APPROVAL OF INSTRUCTIONAL SPACES

Elementary Schools (K-6)

Resource Centers or Libraries	Space Requirements
Schools with less than 150 pupil enrollment	Space may be provided in regular classrooms
Schools with 150 - 300 pupil enrollment	1,000 sq. ft. or one regular classroom
Schools with 300 - 500 pupil enrollment	2,000 sq. ft. or two regular classrooms
Schools with an enrollment of more than 500 pupils	Minimum area to equal 10 per cent of enrollment times 40 sq. ft. per pupil

Classrooms

A REGULAR CLASSROOM, WITH FIXED PARTITIONS, SHALL PROVIDE A MINIMUM OF 900 SQ. FT., INCLUDING STORAGE, OR 30 SQ. FT. PER CHILD, WHICHEVER IS GREATER. A KINDERGARTEN CLASSROOM SHALL PROVIDE AT LEAST 1,000 SQ. FT., INCLUDING STORAGE OR 50 SQ. FT. PER CHILD, WHICHEVER IS GREATER.

It is recommended that 40 sq. ft. be provided per pupil in regular elementary classrooms and 60 sq. ft. per child in kindergarten rooms.

"OPEN CLASSROOM" SPACE SHALL PROVIDE A MINIMUM OF 40 SQUARE FEET PER STUDENT FOR INSTRUCTIONAL SPACE. This shall be determined by deducting the square feet necessary to meet the requirements for the instructional materials center, plus the area in specialized rooms, the administrative and service spaces, from the gross square feet in the building; the remainder is divided by the planned capacity of the building.

Committees may wish to consider additional space for greater ease of pupil circulation within the building.

CONFERENCES BETWEEN THE APPLICANT DISTRICT AND CONSULTANTS IN THE DEPARTMENT OF EDUCATION SHALL TAKE PLACE BEFORE FINAL APPROVAL OF PLANS. The size and number of spaces other than resource centers and classrooms will be approved in accordance with the educational specifications; this will include conference, seminar, and small-group instruction rooms. All designs and drawings must specify each instructional space, such as general classrooms, laboratories, seminar rooms, special instructional areas, etc.

The Middle School

The middle school concept is relatively new. It was developed in an attempt to provide an educational program to serve the needs and interests of the pre-adolescent and early adolescent student. Many patterns of organization and varying programs of instruction are possible in this as yet rather fluid educational concept. However, two fundamental principles are a common basis for a middle school. First, the middle school seeks to offer a grade span of at least three years to allow for a gradual transition from elementary to secondary school; thus the middle school will usually be planned for the pupils between the fourth and eighth grades. Second, in order to facilitate this transition, the instructional program provides for a great deal of flexible scheduling, independent study, etc., on a level adapted to the special needs of this age group.

If a middle school is a part of an applicant district's building program, approval will be based on an evaluation of the goals and objectives of the program as set forth in the educational specifications. Due to the comparatively recent development of the middle school concept, no minimum space standards have as yet been determined for this type of school as an organizational unit, although future experience may indicate the necessity for middle school standards separate from elementary and secondary school standards.

Secondary Schools (7-12)

A REGULAR CLASSROOM, WITH FIXED PARTITIONS, SHALL CONTAIN A MINIMUM OF 800 SQ. FT., INCLUDING STORAGE, OR 30 SQ. FT. PER STUDENT, WHICHEVER IS GREATER.

Subject	Square Feet Per Student	
	Acceptable	Recommended
Regular Classrooms (English, Math, Language)	30	35

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Subject	Square Feet Per Student	
	Acceptable	Recommended
Social Studies	35	40
Language Lab.	35	40
Science		
Combination Lab-Classroom	60	70
Single-Purpose-Room Lab.	50	60
Art	60	70
Industrial Arts		
Junior High	75	100
Senior High	100	125
Home Economics		
Food or Clothing Laboratory	50	60
All-Purpose Department	60	70
Music		
Instrumental	35	40
Choral	10	15
Practice Rooms and Storage as Required		

Library-Resource Center: 10 per cent of enrollment at 40 square feet per student. Minimum area approved: 1,800 sq. ft. (See Chapter VII).

Vocational Offerings	Square Feet Per Student	
	Acceptable	Recommended
Agriculture		
General Shop	130	150
Horticulture Shop	75	100
Greenhouse	100	120
Business and Office Occupations		
Bookkeeping, Stenography	40	50
Typing, Business Machine	35	40
Office Practice Lab-Classroom	50	60
Distributive Occupations		
Combination Lab-Classroom	60	70
Health Occupations	60	70
Occupational Home Economics		
Food Service, Lab-Dining Area & Storage	110	120
Child Care Services	110	120

Vocational Offerings	Square Feet Per Student	
	Acceptable	Recommended
Trade and Industrial Education		
Auto Mechanics	175	200
Machine Shop	150	175
Building Construction	125	150
Drafting	60	80
Electricity-Electronics	60	80
Printing-Graphic Arts	100	125
Welding	60	80
Culinary Arts, Cooking	100	125
Building Service Mechanic	60	80
Plumbing, Heating, Sheet Metal	80	125

It is recommended that classrooms and related laboratory facilities be located adjacent to each other or in proximity, and that additional storage space be provided. These recommendations are made for any vocational program, whether or not Federal funds are to be applied for.

CONFERENCES BETWEEN THE APPLICANT DISTRICT AND CONSULTANTS IN THE DIVISION OF VOCATIONAL-TECHNICAL EDUCATION ARE TO BE HELD EARLY IN THE PLANNING STAGE. The consultant will advise the committee on the basic facilities and items of equipment necessary for a vocational program. He will also suggest ways to strengthen the vocational program by including a combination of vocational offerings specially suited to the needs of the district, including multipurpose rooms and storage facilities, etc.

General

Space requirements for gymnasiums, all-purpose rooms, kitchens, health, administration and general pupil services are described in Chapter VII, "Instructional Elements of the School."

CHAPTER IX - AUXILIARY SPACES

Auxiliary spaces in schools are those spaces that serve in a supportive capacity to the instructional program and also accommodate the nonclassroom needs of students and staff. Although such auxiliary spaces as hallways, rest rooms, and storage facilities are found in older schools, the increased use of this type of space for the support of instruction has been a fairly recent development. New trends in teaching methods, new and varied concepts in school design, new media for disseminating information, and a new attitude towards the school's function as a community center have all contributed to this development. These factors will assume more importance in future years, and auxiliary spaces must be designed as an integral part of the total educational program.

Thorough, careful planning is most important in this area of the school building program. The auxiliary spaces must be planned with full consideration of such factors as increased enrollment and possible future changes in educational philosophy and methods. Additional classrooms can usually be added without difficulty, but auxiliary space can seldom be expanded after initial construction. Overcrowded auxiliary facilities become inefficient and this inefficiency can be reflected in the usefulness of the entire structure.

School planners should be aware of the possibility of multipurpose uses of auxiliary spaces. An initial step in this direction is an analysis of the basic function of each auxiliary space required to fulfill the educational specifications. In general, spaces such as private offices, custodial quarters, kitchens, and rooms for mechanical plant equipment and operation do not lend themselves readily to multipurpose use, unless they can be used for classes relating to their specific functions, as, for instance, use of the kitchen for a home economics program. Such spaces as the lunchroom, the gymnasium, and the auditorium may be combined in several ways. For instance, the cafetorium is a lunchroom and auditorium; the gymtorium serves as gymnasium and auditorium; the same area can serve all three of the above functions; and the auditorium can be combined with a theater.

Once the basic function of each auxiliary space has been determined, planners should consult with the architect and other experts in order to integrate these spaces into the total project. Some of the questions that will arise in this connection are whether some spaces, if enlarged, would do the work of two, but in less area; whether greater flexibility for changes can be achieved by a combination of two or more areas; whether savings can be realized in the costs of construction and operation; whether the disadvantages of converting from one use to another in the same space would offset the possible savings. Multi-use auxiliary spaces should never be planned merely as a compromise to save money or to fit a building on a limited site; such compromises may even reduce the usability of the space so that it will not serve any of the planned purposes satisfactorily.

A brief discussion of the auxiliary spaces for administration, guidance, faculty facilities, auditoriums, school lunch, and health services, as well as of fallout shelters is presented in the following pages.

Administrative

School planners too often allow only restricted space for the administrative suite. The suite should be centrally located in the building, where it will be easily accessible to the public. While the office need not be elaborate, its general appearance should give the visitor the impression that it is the school headquarters. Ideally, the main office should be divided into at least two areas, one of which should be a soundproof inner office for the principal. The principal's office should be large enough for conferences with teachers, students, or other groups. The outer office should provide adequate space for the clerical personnel and equipment. In a larger school a separate office should be provided for the principal's secretary.

The administrative suite should also include the following:

1. Adequate filing and storage facilities.
2. An intercommunication system within the school.
3. Durable, comfortable, attractive furniture.
4. Good lighting for all areas.
5. Even heat and ventilation.
6. Provisions for safeguarding funds, records, etc.
7. Ample electrical outlets for office equipment.

Guidance

This space should be located near the library or instructional materials center. The facility should be designed along the following lines:

1. One counselor's office for every 500 pupils or portion thereof (of maximum enrollment).
2. Each counselor's office should be at least 8' x 12.5', for a minimum of 100 square feet.
3. One waiting room containing a receptionist-secretary area, work tables, shelving for books and bulletins, and filing cabinets.
4. One conference room large enough to seat twelve people comfortably.
5. Storage space for testing materials, etc.

Auxiliary Faculty Facilities

Two types of facilities for teachers' out-of-classroom use should be included in the school: preparation-conference spaces and dining-lounge areas, either separately or in combination.

In the past teachers were given little space other than their desks in the classroom for the preparation of instructional materials. However, if creative teaching is to be one of the objectives of the instructional

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program, teachers need more space to plan and develop materials. This space should provide a wide variety of equipment for the reproduction of text and graphic aids, storage space for supplies and prepared materials, conference rooms, and if possible, individual desks for each teacher.

It is recommended that the school provide a faculty lounge for refreshment breaks and rest, and a separate eating area for faculty members. These facilities are important for good teacher morale.

Auditoriums

The auditorium and/or theater serves a dual purpose: (1) It is a convenient place for large group assemblies for instruction, meetings, display and presentation of information, including visual materials; (2) it provides facilities for instruction and participation in the performing arts (music, theater, dance, elocution, etc.). There are few single-purpose auditoriums in New Hampshire due mainly to the expense involved and limited utilization.

However, the addition of a third dimension to the original functions of the auditorium may make construction of this type of facility more feasible: some parts of this space may be adapted to almost continual use for instructional purposes except for the rare occasions when full use of the hall is required. If the auditorium can be utilized for both small and large group instruction during the school day by the use of folding walls or other dividers, planners may find some economic justification for constructing this space, since it may be possible to eliminate teaching spaces in other parts of the building.

School Lunch Facilities

A school lunch program requires two major types of space: one for preparation (including receiving, storage, preparation and cleanup areas) and one for dining. A participation of 75 per cent of elementary students, 60 per cent of high school students, and 30-50 per cent of faculty and staff may be projected for a well-managed lunch program.

The preparation and storage facilities should be located at ground level with a separate service entrance and should be adjacent to the dining area. The following space requirements apply to the kitchen and dining areas:

Kitchen:	Preparation area, including refrigeration, 2 sq. ft. per meal. Dry storage: ½ sq. ft. per meal. Total - 2½ sq. ft. per meal.
Dining Area:	Elementary - estimate 1/3 of total enrollment seated at one time; 10 sq. ft. per pupil. Secondary - estimate 1/3 of total enrollment seated at one time; 12 sq. ft. per pupil. Faculty - Separate facilities suggested; 10-12 sq. ft. per person.

Provisions should be made for separate office space for the program manager. A separate lavatory for food service personnel with adjacent locker facilities is also recommended.

Detailed guidelines for facilities and equipment are available upon request from the Department of Education. If school lunch facilities are planned, the committee should review the regulations of the current Sanitary Food Code, published by the State Department of Health and Welfare.

School Health Facilities

Proper and complete physical facilities are a necessity for effective health services. A qualified school nurse should be consulted when planning the health suite. This space should be located near the guidance office and the administrative office, as close to the main entrance of the school as possible, and easily accessible to students, parents, and school personnel. Space requirements vary according to the enrollment, available staffing, and the scope of the total school health program. In general, a minimum of 625 square feet of space is recommended for a school of 750-1000 students; schools with lower enrollment can modify the arrangements of the health suite according to school and community needs.

The health area should provide the following facilities:

1. Reception and waiting area (may be combined with guidance and/or administration.)
2. Office and record storage for the school nurse (clerical staff, telephone, intercom system are recommended in addition to regular office materials.)
3. Resource library with materials for health instruction ("health alcove" in school library including audio-visual materials.)
4. Comfortable rest rooms for temporary care of students and/or personnel.
5. Conference room for consultation and health counseling.
6. Examination room and equipment for hearing and visual screening, dental health inspection.
7. Space for scientific, health education displays.
8. Toilet facilities and extra lavatory for frequent hand washing.
9. Storage for first aid supplies, etc.

Support Facilities

Many buildings are constructed with insufficient storage space for instructional and noninstructional needs. Plans have to be made for centralized storage of instructional material as well as for provision for some classroom storage facilities. Once they have been in use for several years, most buildings prove to have inadequate space for the accumulated materials.

The custodial staff must have convenient and adequate storage facilities for its use. There should be a satellite storage and/or work area for custodians on each floor and if the building is large, two smaller areas

on each level might be planned. If the school system is sufficiently large, the building might include a maintenance shop for the staff and an office for the head custodian.

When planning the location of all storage areas, the committee should keep in mind the service and delivery entrance. Supplies and materials delivered to the building should not have to be carried too far inside and should be moved so they do not interfere with student traffic. Outside the building the service and delivery entrance should be independent of normal student and faculty traffic.

An important consideration in planning today's schools is the method to be used for disposal of waste -- will there be an incinerator within the building or will the refuse be picked up for off-site disposal? It might be practical to correlate this activity with the general practice within the community. Local regulations will probably govern the proper disposal of waste.

Schools with an athletic program and physical education curriculum will also have to plan for exterior storage of equipment and machines. Many schools find it convenient to have a separate building on the athletic field for storage of instructional equipment as well as mowers and other machines. Convenient location of such storage facilities can often reduce the time and effort of instructors and groundskeepers in organizing and carrying out their assignments.

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CHAPTER X - FURNITURE AND EQUIPMENT

The selection of furniture and equipment for classrooms, laboratories, resource centers, gymnasiums, offices, etc., must be a part of the initial planning phase. Flexibility and adaptability are major factors to be considered in choosing furniture and equipment. Movable equipment is recommended wherever practical in order to make instructional aids available to as many students as possible, and to facilitate independent study. A comfortable environment is essential to the learning process, and furniture and equipment should be comfortable to use, adjustable so that it may be adapted in size and height to the age group or to individuals for which it is intended.

Units should be selected not only to serve immediate needs, but with a view to fulfilling future requirements. Many items available today provide both movability and multipurpose usability. School planners should make sure that all furniture and equipment serves the educational specifications laid down initially. They should also ascertain before purchasing any item that all applicable building codes are being observed.

For convenience, the equipment schedule should be in two major groupings: equipment (fixed items) and furniture (movable items). Items within the two groups can then be divided into specific categories, such as shop, library, etc. Both unit prices and a total bid for a particular grouping can be requested.

Equipment Consultant

If the building project is extensive and requires considerable outlay for equipment, consideration might be given to engaging a consultant with expertise in the area. Such a professional can offer a service that will assure the purchase of the proper equipment for the project. He can also aid in the writing of specifications for bidding and can follow progress of the project to assure arrival and installation of equipment at the proper times.

Many of the larger architectural firms have equipment consultants who can provide this service, and committees can decide under what circumstances to employ such an individual.

The architect should work closely with the equipment consultant or the local officials for good coordination in the purchase and installation of equipment.

A method gaining favor is the submittal of bids for furniture direct to the client or equipment consultant. This method assures that the educational specifications will be followed; it also provides for professional coordination of the mechanical, electrical, and construction design, as well as aesthetic considerations of color, finish, and design that will complement the structure as a whole.

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If bids for furnishings are solicited separately, the following procedure is recommended:

Advertise:	Inform as many suppliers and manufacturers as possible.
Bidding Documents:	Prepare concise drawings and specifications. Allow a minimum of two weeks for quotations.
Bid Openings:	Establish time and place to open and read bids.
Bid Evaluations:	See that proposals comply with specifications. Check bid security and delivery dates. Check any alternative proposals.
Furnishings Review:	If there are enough reasons to warrant, ask all qualified bidders to present samples, catalogs, and to meet to answer questions.
Contract Award:	The contract should be awarded to the lowest bidder who meets or exceeds the specifications. A company that bids as specified should be given prime consideration. Other bidders who propose alternative furnishings should be given careful control, item-by-item consideration.

Installation

The installation of furniture and equipment requires thorough attention and supervision by all those concerned. It is recommended that a check list be used and that the architect be consulted in the final evaluation of installation.

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CHAPTER XI - FIRE SAFETY REQUIREMENTS

There is much greater emphasis today for life safety in our society resulting in stricter laws and regulations pertaining to new construction. The standards set by state law and regulations are, for the most part, minimal requirements, and should be exceeded wherever possible. The following codes are used as a basis for approval of building plans by the State Fire Marshal and those charged with the planning and design of buildings should have access to them.

"National Building Code"
American Insurance Association
85 John Street
New York, N.Y.

"Life Safety Code"
National Fire Protection Association
60 Battery March Street
Boston, Mass.

"Storage and Handling of Flammable Liquids, Gases, Liquid Petroleum Gases"
"Installation of Oil Burners and Equipment"
"Coconut Grove Law"
"Fire Escapes"
Division of Safety (State Fire Marshal)
John O. Morton Building
Concord, N.H.

Standards For Fire Safety in School Buildings

All plans and specifications for new school construction must be approved by the State Fire Marshal prior to the time the plans are put out for bid. The Fire Marshal evaluates the drawings and specifications according to the regulations issued by the State Board of Fire Control mentioned in Chapter II of this Guide. Regulations governing the acceptance of the plans and specifications are taken from the statutes passed by the General Court and from the codes mentioned at the beginning of this chapter. Specific statutes that pertain to fire safety requirements in public buildings are:

Chapter	Subject
RSA, Chapter 155:7 and 155:8	Covering of Inflammable Surfaces
RSA, Chapter 155:8-a	Building Standards
RSA, Chapter 155:9-39	Fire Escapes-Exits-Places of Assembly
RSA, Chapter 155-A:1-3	Construction and Inspection of Public Buildings (National Building Code)

Before building aid is approved by the State Board of Education a certerficate of approval of the plans and specifications must have been received from the Fire Marshal.

In addition to state laws and regulations, local building codes and regulations should be reviewed prior to the design phase of the project. Often local codes are more rigid than state laws or regulations.

Fire Extinguishers

Suitable approved fire extinguishers shall be provided for the shops, kitchen, laboratory, heater rooms, and fuel storage. Fire extinguishers shall be of a type approved by the Underwriters' Laboratories and be readily available in special cabinets or on wall racks. An extinguisher should be located near each school alarm-sounding station.

Different types of extinguishers should be placed in different locations, according to the kind of fire likely to occur in the area. The following information should be helpful in selecting and placing the equipment:

Type of Extinguisher	Location in Building	Use
Pressurized Water	General use throughout building	Not for use on electrical and flammable liquid fires.
Carbon Dioxide Dry Chemical	Locate near flammable liquid storage, electrical panels, and science equipment.	Liquid and electrical fires. Not effective for deep-burning fires.

Fire Alarm Systems

Every school building of more than two regular classrooms shall be equipped with a suitable fire alarm system. Electrical systems shall be provided in all schools of more than one story or more than eight classrooms. Such systems shall be of the type known as a closed circuit, supervised, and with break glass stations. There shall be an alarm-sounding station in the heater room, and at least one in each corridor, with additional stations located as required by conditions in the building. The alarm-sounding devices shall be clearly marked "Fire Alarm" and painted red. Either gongs or horns may be used. Any gong used shall be of the single stroke type with a tone distinctive from the regular passing bell system.

Use of Sprinklers in Schools

School boards and school planners are urged to give serious consideration to the installation of sprinkler systems throughout the school plant. The high initial cost should be weighed against the potential savings that might result from the installation of a sprinkler system. When a sprinkler system is installed, one can expect substantial savings in insurance premiums and when fires do occur in buildings with a sprinkler system, one can expect much less property damage. Statistics also prove that the loss of life is much less in buildings equipped with a sprinkler system and/or heat/smoke detector devices.

FIRE ALARM SYSTEMS, SPRINKLER SYSTEMS AND SMOKE DETECTION SYSTEMS IN BUILDINGS SHOULD BE CONNECTED TO MUNICIPAL FIRE DEPARTMENT FOR MAXIMUM EFFECTIVENESS.

Correct Usage of Fire Safety Features

As some recent fire disasters have demonstrated with tragic results, the most expensive fire protection equipment will be useless if made inoperable through carelessness or neglect. Even if all parts of the building meet or exceed the fire safety standards, the equipment must be in working order at all times. All personnel, from the school board and superintendent of schools to the custodian, share a role in this responsibility.

The misuse of anti-panic devices is widespread and can result in real fire hazards. It is not uncommon to find fire screens in corridors propped open, the fireproof door to the boiler room wide open to help heat the basement, and main exit doors fastened with a dead bolt while the building is occupied. Often the proper hardward has been installed, but is out-of-order. This induces a false sense of security and results in a more unsafe condition than using inadequate hardware.

RSA, CHAPTER 155:26-V REQUIRES THAT .... "DURING THE PERIOD OF OCCUPANCY, NO EXIT DOOR SHALL BE LOCKED, BOLTED, OR OTHERWISE FASTENED SO THAT THE DOOR CANNOT BE OPENED FROM THE INSIDE BY THE USE OF THE ORDINARY DOOR KNOB OR BY PRESSURE ON THE DOOR OR ON A PANIC RELEASE DEVICE."

Fire Drills -- Some Simple Rules

1. Consult and work out jointly with the local fire chief the procedure for fire drills.
2. Make certain that the local department knows the exact location of the main electric cut-out switch, as well as the shutoff to the oil storage tank and to the sprinkler system if there is one in the building.
3. Plan regular fire drills throughout the school year.
4. Record the date of the fire drill and the time necessary to evacuate the building. Post this information in the main office and send it to the local fire department.
5. Plan evacuation of the building in various ways, so that pupils will become familiar with all parts of the building and with the types of panic hardware on different doors and their operation.
6. Teachers and custodians must participate in the drills and leave the building with the students.
7. Request the fire chief to visit the building on occasion to sound an alarm without first notifying the principal or custodian.

RSA, Chapter 155 contains the legal safety requirements and school planners should be thoroughly familiar with its contents.

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CHAPTER XII - A HEALTHFUL SCHOOL ENVIRONMENT*

In planning a healthful school environment, all factors affecting the school population must be considered. The "total environment" of the school must contribute to the physical well-being of students and provide surroundings conducive to good mental health. A school building should be comfortable, pleasing and safe.

The "red brick box" with fresh paint and clean windows of bygone years is no longer satisfactory by today's standards. Aesthetic considerations should be part of all school planning, from landscaping the grounds and parking spaces to attractive learning areas with comfortable, well-designed furniture and equipment in pleasing colors. Appreciation of beauty is a part of the learning process and this opportunity should be offered to students as part of the school environment. An aesthetically-appealing school is not necessarily expensive to build. Designers and architects can apply their professional expertise to provide a functional, flexible structure that will not only fulfill the educational specifications, but will also offer the intangible aspects contributing to a healthful total learning environment.

Heating and Ventilation

The correct temperature, humidity, and air circulation are basic conditions for a comfortable environment. The type of systems to be installed for satisfactory heating and ventilation conditions should be selected only after thorough evaluation by the committee with the advice of the architect. In the past, hot water or steam systems, fired by coal, oil, or gas have been the most commonly used means of providing heat. More recently, electric heat has been installed in many schools; it offers the advantages of lower installation and maintenance costs and generally better room control. However, careful study is needed to determine which type of system will be the most economical in operation. Modern technology has made it possible to control heat evenly throughout all parts of a building with any type of system, so that satisfactory heat and humidity control may be assured. Although higher installation expenses may affect the initial cost of the building, committees should consider the long-range effects of the expense of operating and maintaining a heating system.

The heating and ventilating systems are closely connected in function and operation and must be considered together in planning the installation. Unit ventilators may be used in some areas of the building to complement or supplement the regular mechanical ventilating system. They operate either by bringing in outside air before being heated or by recirculating existing air in the room and purifying it. The function of a ventilating system is to exhaust the used air in a given space and to replace it with a corresponding amount of fresh air. For this purpose a means of entrance must be provided for fresh air, as well as a means of exhaust for used air. Transoms and louvres have been used in the past; however, they represent a fire hazard, transmit sound, and are comparatively inefficient. For best results, exhaust outlets should be located close to the floor, where cooler air is found. This also contributes to increased heating economy, since as much as 30 per cent of the heating load is due to the necessity of heating the incoming fresh air, and due to the loss of heat when the warm air is exhausted from the room.

Recommended Minimum Requirements for Proper Ventilation

1. In classrooms, regardless of the type of activity to be carried on in the room, provisions for air change shall be made. There should be a minimum of 10 c.f.m. of fresh outdoor air per occupant when the outside temperature is 35 degrees F., or above. The minimum air change may be reduced progressively to a minimum of 4 c.f.m. per occupant when the temperature is minus 20 degrees F.

2. Mechanical ventilation providing a minimum air change of 10 c.f.m. per occupant shall be provided for places of assembly, such as auditoriums, cafeterias, gymnasiums, etc. Additionally, sufficient ventilation should be provided to prevent overheating when large numbers of people are assembled.

3. Air quantities for special areas should provide the minimum as listed below:

Locker and Shower Rooms	1 c.f.m. per square foot floor area
Toilets	2 c.f.m. per square foot floor area
Kitchen and Dishwasher Areas	75 c.f.m. per square foot hood area

4. Special ventilation

   a. Hoods with mechanical exhaust shall be installed over steam kettles, dishwashers, ranges and other heavy-duty appliances.
   b. Removable grease filters shall be provided in kitchen ductwork with adequate clearance from ends of flues or appliance vent to grease filter. Provision for cleaning should be provided.
   c. Fire dampers should be provided in ducts from main kitchen exhaust hoods.
   d. Cafeteria ventilation can be combined with the same exhaust system providing kitchen ventilation; however, consideration must be given to the reduction of the transmission of noise between rooms.

5. Local mechanical ventilation shall be provided at benches for electric welding and also at spray paint stations.

6. Internal combustion engines shall be exhausted to the outdoors.

Duct Design and Construction

This should follow standard practices. Grilles from two or more rooms should in no case open directly into a common flue or duct; individual ducts may be gathered into trunk lines. Exhaust ducts or flues should be fire-resistive throughout and should have self-closing dampers where passing through fire partitions. Exhausting through corridors is not recommended.

In small additions to existing buildings, unit ventilators or roof fans could be installed. Provision for ventilation should be made in all new construction regardless of size.

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Air Conditioning

The heating, ventilating and air conditioning installations shall meet the requirements and recommendations of the American Society of Heating, Refrigeration and Air Conditioning Engineers.

Windows in Classrooms

Several factors must be taken into consideration in deciding on the number and type of windows to be installed in classrooms. The trend in recent years has been to reduce the number of windows, for many reasons. First, fewer windows reduce glare and improve thermal conditions, although structural glass blocks, ultra-violet or diffusing glass, and heat-absorbing materials may be used to admit some natural light while producing relatively little effect on the thermal equipment. Second, the open school concept with its use of movable partitions has to a great extent eliminated interior wall area, so that exterior walls provide practically the only place to install blackboards and chalkboards. With wall space at a premium, decision must be made as to the best allocation of this space, and often windows have been eliminated entirely in favor of other permanent classroom fixtures. A third consideration in reducing window area has been the increasing use of audio-visual equipment, where it is considered important to be able to darken a room easily and quickly.

On the other hand, aesthetic considerations should be taken into account; a pleasing environment must include a balance of the external and internal spaces; judicious use of windows contributes to such a balance. A school without windows may give the impression of a prison or fortress, an effect that is certainly not conducive to a healthful learning environment. It should also be pointed out that windows were the original method of ventilating an enclosed space, and modern technology has yet to find a substitute for the invigorating influence of large quantities of fresh air entering, directly from the outside, a room in a building.

School planners should base their decision as to the number and types of windows to be installed in the new building on the preceding considerations with due regard to the educational specifications and the educational philosophy of the community.

Visual Environment -- Natural and Artificial Lighting

The visual environment must provide both comfort and efficiency. A poor visual environment over a period of time can produce detrimental physical and psychological effects, whereas a good visual environment promotes comfort, accuracy and speed in seeing and hence in learning. Criteria for a good visual environment include not only the level of illumination, but also control of light sources, glare, brightness, and contrast. It is recommended that the architect and planners retain the services of engineers to advise on the types of lighting fixtures, candlepower, window areas in the various rooms, the location of the rooms in relation to the direction of sunlight, and the color of the walls. The color surfaces of equipment and furniture are also important factors in creating a visually harmonious environment.

MINIMUM STANDARDS FOR FOOTCANDLES OF LIGHT IN ALL NEW CONSTRUCTION

Classrooms and instructional areas on "all work surface"	50
Classrooms for the partially sighted	70
Study halls, lecture rooms, science laboratories, offices, etc.	50
Sewing rooms, typing rooms, drafting rooms, shops	70
Auditoriums, gymnasiums, cafeterias, all-purpose rooms	30
Locker rooms, washrooms, corridors with lockers	20
Open corridors and storerooms	10

Sonic Environment

A good sonic environment is as important to the learning process as a good visual environment, and the control of noises originating inside and outside the building must be carefully studied in order to provide optimal acoustic conditions. New educational methods and innovations in schoolhouse construction require techniques of sound control. In the traditional school, student activities take place in numerically stable groups, within a fixed area in an enclosed classroom. Noise control inside the building is concerned primarily with movement between classes at regular intervals, recess periods, and certain activities, such as shop or physical education. In the newer schools, provision is made for greater freedom of movement by the pupils, with learning activities organized in groups of varying sizes, larger learning spaces, and more open construction. The methods of noise control must be planned in accordance with these trends. Various types of partitions, acoustical materials for ceilings, carpeting on the floors, different types of wall finishes are available for this purpose. Zoning is an effective means of noise control: the activities that produce the most noise can be grouped together and may be located in a part of the building close to an external noise-producing area, such as a playground.

School functions that produce disturbing noises are not the only factor to be taken into account. The sonic environment of the school must be an important consideration when selection a site (see Chapter V). If at all possible, the site should be free from noise by traffic, including air traffic, industry, and any other sources. Engineering advice on all acoustical aspects of the building is necessary to provide a healthy sonic environment.

Water Supply and Sewage Disposal

An adequate water supply and sewage disposal system are essential elements of any school building and are subject to control by a state agency.

THE NEW HAMPSHIRE WATER SUPPLY AND POLLUTION COMMISSION IS CHARGED WITH THE RESPONSIBILITY OF APPROVING THE WATER SUPPLY AND SEWAGE DISPOSAL SYSTEM. THIS AGENCY SHOULD BE CONSULTED PRIOR TO SELECTION AND PURCHASE OF A SITE (See Chapter V -- "Site Selection").

If the site being considered cannot be connected to an existing municipal system and the district must supply its own water to the school, this agency must approve the source, condition and volume of water to be used in the school. The volume is determined by the program to be offered; the educational specifications should provide the guidelines for all decisions with regard to site or source of water supply.

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IN GENERAL, 15 GALLONS PER DAY PER PERSON WILL BE REQUIRED; THIS INCREASES TO 30 GALLONS PER DAY IF PHYSICAL EDUCATION AND A HOT LUNCH PROGRAM ARE OFFERED.

Drinking Fountains

There should be one drinking fountain per 60 students. It is recommended that a separate fountain be located in each elementary classroom and in other specialized instructional areas. Electrically-cooled fountains offer many advantages; for sanitary reasons the bubbler shall be so constructed as to prevent the user from placing his mouth on the opening.

IT IS STRONGLY RECOMMENDED THAT THE DRINKING FOUNTAIN OR BUBBLER BE SEPARATE FROM THE HAND WASHING SINK.

Toilet Rooms

Toilet rooms should be of adequate size, accessible to all classrooms, and well lighted and ventilated. Separate facilities should be provided in the administrative suite, the gymnasium area, and the custodial unit, and are highly recommended in kindergarten and other primary classrooms. Tiled walls and floors are preferred for easy cleaning and maintenance. If the school is to be constructed on the open plan, common toilet facilities will reduce installation costs because all plumbing facilities can be in one location.

Sinks

ONE SINK, SUPPLIED WITH COLD WATER, MUST BE PROVIDED IN EACH BUILDING. The location and number of sinks will depend on the size of the building and the educational program. The following guidelines should be considered:

1. One sink supplied with both hot and cold water is strongly recommended in each elementary classroom and in some secondary classrooms, janitor's room, and library workshop.
2. Shop sinks should be suitable for group wash-ups.
3. One sink supplied with both hot and cold water is recommended in each study unit of the art room, homemaking room, science laboratory, shop, kitchen, and social studies laboratory.
4. At least one slop sink for each story is recommended; additional slop sinks should be installed where necessary to reduce custodial travel.
5. One slop sink in each custodial service room.

MINIMUM REQUIREMENTS FOR PLUMBING IN SCHOOL BUILDINGS

Toilet Fixtures

Water Closets:		Urinals:	
Girls, grades K-8	1-30	Boys, grades K-8	1-30
Boys, grades K-8	1-45	Boys, grades 7-12	1-45
Girls, grades 7-12	1-45		
Boys, grades 7-12	1-60		

Lavatories

Boys and girls, all grade levels 1-40

Note: Wash fountains and lavatories in special areas such as shops, locker rooms, lavatories, etc., will be in addition to the above requirements.

Suggested Sizes and Heights of Plumbing Fixtures by Age of Pupils

Water Closets	Communal		Classroom	
Kindergarten	Standard	Size	Standard	Size
Grades 1 and 2	"	"	"	"
Grades 3-6	"	"	"	"
Grades 7-9	"	"	"	"
Grades 10-12	"	"	"	"

Lavatories, Height to Rim

Kindergarten	22 in.
Grades 1 and 2	26 in.
Grades 3-6	28 in.
Grades 7-9	30 in.
Grades 10-12	32 in.

Drinking Fountains, Height to Nozzle

Kindergarten	26 in.
Grades 1 and 2	28 in.
Grades 3-6	32 in.
Grades 7-9	35 in.
Grades 10-12	35 in.

All fixtures shall be of an approved type, and plumbing must conform to local and state rules and regulations.

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CHAPTER XIII - FINANCING THE SCHOOL BUILDING PROGRAM

There are several methods of financing school construction, and school boards should, after careful consideration and with the advice of legal counsel, choose the plan which is most appropriate to the type of building projected and to the financial resources of the district. Each method has certain advantages and disadvantages, which are briefly discussed below:

The "Pay-as-you-go Plan"

Under this plan a capital project is financed by the use of current revenues which are voted annually as the project progresses. A large school system with constant building needs predictable on an annual basis may choose this type of funding. One evident advantage of this method is a reduction of the cost of the total project, since no interest would have to be paid for a bond issue. On the other hand, most districts, especially small ones, may find this method imposes too great a burden on the local tax structure, since the adoption of the "pay-as-you-go" plan locks a district into an automatic increase in the local property tax rate (quite apart from other school needs) for as many years as it takes the project to be completed. Although most districts may not finance major projects in this manner, some capital outlay programs may be carried out through annual budget appropriations, such as site acquisition, a small building addition or renovation, or the purchase of equipment.

Capital Reserve Funds

According to RSA 35:1, passed by the 1943 session of the General Court, school districts are authorized to establish reserve funds for the construction, reconstruction, or acquisition of a specific capital improvement or specific items of equipment. By this method certain funds are set aside on a regular basis for future capital improvements and are accumulated until sufficient money is available in the fund to finance the proposed capital expenditure.

The advantages of this plan, as under the "pay-as-you-go" plan, are that no interest need be paid and that the funds are usually invested, thus earning dividends which tend to offset rising construction costs. On the other hand, taxpayers may be unwilling to vote for large sums of money to be placed in a capital reserve fund year after year to finance indefinite building plans; also the purpose of the funds may be changed by the voters before enough money is on hand to initiate the originally projected program. Here again the importance of long-range planning becomes evident; taxpayers will be much more likely to support a capital reserve fund if the needs and goals of the district over a period of years have been determined beforehand and are presented in an orderly format.

It is recommended that committees and school boards give careful study to RSA Chapter 35 if they are considering a capital reserve fund. This chapter outlines the legal requirements for these funds, including the purpose, how voted, payments, investments, Trustees of the Funds, payments from surplus, appropriations, expenditures, and change of purpose. Legal counsel should be retained for advice at all stages of the proceedings.

Serial Bonds or Notes

The most frequently used method of financing a school building project is the issuance of bonds or notes. Borrowing all the money needed for a project at one time offers the advantage of spreading the cost of financing over several years while allowing the projected facilities to be constructed to serve immediate needs. In view of steadily rising construction costs, an early start of construction will enable the district to realize important savings. With proper planning, this type of financing may be obtained at a time when interest rates are comparatively low. The cost-sharing aspect of financing by bond issue should also be considered: with a 20-year bond issue, for example, the costs of the new building are borne proportionately by both present and future taxpayers, i.e., those who are using the building after its completion are helping to defray the costs of construction. Other advantages of this method are the stabilization of the local tax rate by consistent payments over a period of years; the reduction of the district's indebtedness, permitting borrowing for other projects if necessary; protection of the district's credit; and simplification of budget procedure through planned annual payments. This method has certain disadvantages, chief of which is the increased total cost of the project due to the necessity of paying interest; also, taxpayers may object to paying for facilities for many years after they have been in use and perhaps in need of repairs or additions before the original structure is paid for. This objection may be countered by sound planning procedures.

Bonds or notes may be issued by a municipality, including school districts or counties, for the acquisition of land, for the construction, reconstruction, alteration, and enlargement or purchase of public buildings, for other public works or improvements of a permanent nature, for the purchase of equipment of a lasting nature, and for the payment of judgments. Bonds or notes may not be issued for the payment of expenses for current maintenance or operation. Municipalities, districts, or counties shall not issue bonds or notes payable on demand.

Preliminaries to the Issuance of Notes and Bonds

Competent legal counsel should be retained early in the financing program. With the aid of bond counsel who generally represents a financial institution, he can guide a bond or note issue through the necessary legal requirements. School boards, administrators, and committees should be thoroughly familiar with the provisions of the Municipal Finance Act, RSA Chapter 33, governing the conditions of bonds and notes. The General Court may change or annotate these statutes at any time; it would therefore be advisable to maintain communications with the State Department of Education on this matter. Information on recent or pending legislation may be very useful to school planners in setting up the financial program.

The following information on the debt limits for various types of school districts and on the computation of these limits will form the foundation for any funding program involving the issuance of bonds or notes:

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1. Debt limit: RSA 33:4-a and 33:4-b

   a. School districts shall not incur indebtedness at any one time of an amount exceeding seven (7) per cent of its assessed valuation as last equalized by the Tax Commission in RSA 33:4-b.
   b. Cities shall not incur indebtedness for school purposes to an amount at one time outstanding exceeding seven (7) per cent of its assessed valuation as last equalized by the Tax Commission, as determined in RSA 33:4-b.

2. Debt limit computation shall be based on last locally assessed valuation of the municipality as equalized by the Tax Commission. Whenever several municipalities possessing the power to incur indebtedness cover or extend over identical territory, each such municipality shall so exercise the power to incur indebtedness under the foregoing limitations so that the aggregate indebtedness of such municipalities shall not exceed nine and seventy-five hundredths (9.75) per cent of the valuation of the taxable property as hereinbefore determined, except for cooperative school districts.

3. Cooperative School Districts: RSA 195:6 -- Each cooperative school district shall have the power to borrow money and issue notes or bonds in conformity with RSA 33 provided, however, indebtedness of a cooperative district organized to provide both elementary and secondary schools may be incurred to an amount not to exceed ten (10) per cent of its assessed valuation as last equalized by the State Tax Commission.

Whenever only a part of the educational facilities of a local school district are incorporated into a cooperative school district, such district shall continue in existence and function as previously. The limits for cooperative districts under these conditions are established as follows:

   a. Elementary grades only: five (5) per cent of valuation as last equalized.
   b. Grades nine to twelve: five (5) per cent of valuation as last equalized.
   c. Grades seven to twelve: six (6) per cent of valuation as last equalized.

4. AREA Schools: In the construction of AREA schools, the receiving district may borrow money for such purposes as provided in RSA 33 as amended. However, in calculating whether it is within its debt limit, there shall be charged thereto an amount no greater than its proportionate share of such capital outlay, which shall be the proportion which its then established enrollment in AREA school to be constructed or enlarged, bears to the then estimated total enrollment therein, as determined by order of the State Board. Attention is directed to RSA 195-A:7 for reference.

5. Exceeding debt limit: There is no provision in the statutes to permit a district to exceed its debt limit. A district may obtain this permission only through a special act of the General Court.

A brief explanation of the different valuations may help to clarify the various standards used to compute tax liability and debt limits. "Valuation by local assessment" refers to the value of all real and personal property in the district (or town), as determined each year by the local selectmen or assessors. This figure is the basis for the tax rate in each locality; it is also used by the Tax Commission to calculate the "valuation as equalized" and "equalized valuation." The valuation as equalized" is determined biennially by the Tax Commission. Using the taxable valuation as a basis, the Tax Commission adds to or subtracts from this figure to show the true market value of all property in the town or district. This complicated procedure is necessitated by the variances in New Hampshire's assessment practices. One hundred per cent assessment at true market value is the exception rather than the rule; in addition, appraisal practices vary from community to community. The valuation as last equalized determines the district's long-term borrowing capacity. "Equalized valuation" is almost the same as "valuation as equalized." This figure is obtained by adding to the valuation as equalized the value of national bank stock and three items of local wealth on which taxes are collected by the state and then returned to the communities: income from interest and dividends, savings bank deposits, and railroad holdings (stock, right of way, buildings). Equalized valuation is used to determine the following:

1. The appointment of supervisory union budgets among the districts of each union.
2. The distribution to supervisory unions of the state's share of the salaries of superintendents of schools.
3. The distribution of state foundation aid to school districts.
4. The apportionment of costs within cooperative school districts, in most districts.
5. Certain nonschool apportionments and assessments.

Calling the School District Meeting

A district is authorized to issue bonds and notes only through the vote of the school district meeting, whether annual or special. It is important to observe all legal requirements when calling a school district meeting, but especially so when a bond issue is contemplated. The advice of legal counsel is vital to assure proper observance of all technicalities.

The legal requirements for annual and special school district meetings are summarized as follows:

1. Annual School Meeting

   a. Authorized by RSA 197:1.
   b. Warrant must be posted fourteen days prior to meeting, not including day of posting and day of meeting (RSA 197:7).
   c. A two-thirds vote of those present and voting is required to authorize the issue of serial notes or bonds (RSA 33:8).

2. Special School Meeting

   a. Authorized by RSA 197:2,3.
   b. Conditions for posting warrant same as for annual meeting.
   c. A two-thirds vote of those present and voting is required for authorization of bonds or serial notes.

d. No appropriation or authorization of bonds or serial notes shall be made except by ballot nor unless the ballots cast at such meeting be equal in number to at least one-half of all the voters in the district entitled to vote at a regular meeting (RSA 197:3).
e. A copy of the warrant shall within one week after posting the warrant be published at least once in a newspaper of general circulation in the district (RSA 197:8).
f. If a checklist was used at the last regular meeting, this list shall be used to ascertain the number of legal voters in the district and such list, corrected according to law, shall be used at the special meeting upon the request of ten legal voters of the district (RSA 197:3).

3. Special School Meeting with Same Authority as an Annual Meeting

a. Authorized by RSA 197:3 in case an emergency arises requiring the immediate expenditure of money.
b. School board may appeal to Superior Court for a special meeting. Authorization if granted gives the special meeting the same authority as an annual meeting for the appropriation of money and the issuance of serial notes or bonds. Such a meeting does not require that one-half of the voters be present. Other requirements of this meeting are the same as for a special school meeting in section (2) preceding.

School District Warrant

The articles to be included in the warrant authorizing the construction of school facilities must be carefully worded in order to provide full warning to the voters of the district concerning the matters to be acted upon. The articles should include the following points:

1. Authorization to build and equip the school, including acquisition of site.
2. Appropriation of the necessary funds and authorization for the issuance of bonds upon the credit of the district.
3. Selection of a building committee to advise the school board in making the necessary contracts, and in the construction of the building.
4. Transfer of any Capital Reserve Funds into the building account for the construction of the school.
5. Authorization of school board and/or building committee to take necessary action for completion of project.

It is extremely important that a careful record of the school district meeting be kept by the clerk of the school district when a bond or note issue is voted. The permanent record must include copies of the original warrant, the certificate of publishing notices in the newspapers for special meetings, and the actual count of the vote. With regard to this last item, the total number of votes cast must be recorded, as well as the number voting for and against, since according to law a bond issue carries only by two-thirds vote of those casting ballots.

Issuance and Sale of Notes or Bonds

After the school district meeting has authorized the issuance of bonds or serial notes, the school board should meet as soon as possible to decide on the following points:

1. Whether the notes or bonds should be issued immediately or at a later date (see following section).
2. The length of the borrowing term.
3. Whether to negotiate the bonds with a New Hampshire securities institution or bank, or whether to advertise the issue for public sale.

The correct decisions on these questions will result in substantial savings to the school district, so thorough consideration should be given to all aspects of the bond issue.

Timing of Issue

The bond market is highly competitive. The level of interest rates is governed not only by factors of supply and demand prevailing at the time of sale, but also by competition among governmental issues and monetary conditions in the private sector of the economy.

Under RSA 33:7a, districts may borrow temporary funds in anticipation of money to be received from the sale of bonds. Districts are allowed one year to determine the most advantageous time to enter the bond market; however, the bonds or notes must be sold at the end of this period regardless of then prevailing interest rates. Help in assessing the state of the bond market may be obtained from such publications as The Bond Buyer or the Wall Street Journal, and from bond dealers and investment bankers.

Negotiating the Issue of Bonds

The school board is the body authorized to negotiate the sale of bonds for the school district. There are three common methods of selling bonds, as follows:

1. Direct sale at a specified interest rate and price to a local bonding house.
2. Direct sale at a specified interest rate and price to a local bank.
3. Issuance of a call for public bids on the issue.

Each of these procedures has certain advantages and disadvantages. Local banks can provide direct assistance with the necessary legal procedures and may offer the advantage of greater familiarity with local conditions. In recent years, however, the issuance of a call for public bids seems to have become the preferred method for negotiating bond issues. In these cases the school board and its legal counsel will work with a municipal department of larger metropolitan banks, who can usually provide more services than smaller investment institutions. In addition, such banks generally employ bond counsel, whose advice may be very helpful in meeting legal requirements early in the process.

Legal assistance is an absolute necessity in planning and administering the bond program. School boards should expect their local attorney to help in meeting all state and local requirements, while bond attorney will not only advise the local counsel, but must also approve the legality of an issue to assure its favorable reception by major bond buyers.

Services Rendered by Banks' Municipal Departments
in Connection with Municipal Bond Issues

1. Review of or preparation of warrant article(s) and motion(s) by recognized bond counsel prior to voting by school district.

2. Processing of certificates from school district clerk and other school district officials and forwarding them to bond counsel, relative to legality of bonds authorized by school district.

3. Liaison with New Hampshire School Building Authority when applicable.

4. Obtain review of municipality's credit rating with recognized rating services, particularly Moody's Investors Service. If no rating, obtains establishment of a provisional rating.

5. Review with school district the timing and details of bond sale. The normal policy is to recommend sale of bonds soon after construction contract for project is awarded. Other factors such as need for bond anticipation funds, market conditions or desire for a particular principal payment date occasionally dictates otherwise.

6. Preparation of notice of sale, advertising bonds for sale, describing nature of project and its financing, financial condition of community, and other major features of the bond issue. Distribution of notices to nationwide list of Municipal Bond Dealers, banks, and other potential bond purchasers.

7. Advertisement in The Bond Buyer for bond issues in excess of $1,000,000. The Bond Buyer is the financial newspaper of the municipal bond business.

8. Opening sealed, competitive bids at bank and advice to school district in determining best bid. Preparation of bonds by recognized bank note company and assistance to school district in proper signing and sealing of bonds.

9. Delivery of bonds to purchaser and advice for proper investment of temporarily unused funds as authorized by law.

11. Furnishing of chart showing principal and interest payments over the life of bonds due at bank.

11. Meeting with school district and other municipal officials as is necessary and desirable.

CHAPTER XIV - PRESENTING THE BUILDING PROGRAM TO THE PUBLIC

The success of a school building program is in large measure dependent on public knowledge, approval, and support. Recent statistics have shown a disturbing country-wide increase in the number of communities that have turned down bond issues or other types of funding for school construction. A major factor in the failure of school building programs is often the neglect of public relations. Good public relations between school and community cannot be created overnight; this aspect must be considered in the earliest stages of planning (see Chapter I, "Planning Educational Facilities"), and a channel of communication must be provided which will permit a two-way flow of information between planners and community. A school board or building committee may assume this task themselves, using all services available, such as an educational consultant, the architect, groups and clubs, public hearings, the news media, to present the program, and at the same time make themselves available throughout the planning and building process to all expressions of public concern.

If possible, it would seem more desirable to allocate this function to a special subcommittee, which would act as liaison between the building committee and the community. Membership should be between nine and fifteen persons; while it is important to have a diversity of community viewpoints represented, too large a committee will be less effective than one of workable size. A member of the building committee could be designated as chairman of the subcommittee, and the school board would, after careful consideration, select the rest of the members from representative segments of the community.

Two basic considerations must be taken into account in developing any kind of group effort. First, all group effort takes place in some kind of social system composed of people with some interest in common; the school board, building committee, and school administrators are the nucleus of this system; every member of the community has an interest or a stake in the educational system. Second, for every group action there exists within the social system past experience, either good or bad; somewhere in the background there has been a similar effort with a history of success, failure, crisis, or conflict. The factors leading to success or failure should be carefully analyzed; good experiences should be capitalized upon, and poor experiences should be studied for techniques and actions to be avoided.

Techniques for Public Relations

Past experience has shown that certain techniques are successful in helping the general public recognize the need for a program. The following general principles and specific suggestions may be helpful in building a good public relations program:

1. Basic Education. This is a long-range program, but is effective in getting facts across to the public.

2. Program Development Committees. Certain key people in the community study situations, problems, resources, etc. Publicizing their findings contributes to public awareness.

3. Comparison and Competition. "Our community is not as good as some others" may be an effective approach. Caution is advisable in the use of this method if the community is proud of its tradition and local autonomy.

4. Exploiting a Crisis. When a crisis arises, this may be used to point up certain needs. Examples are unexpected overcrowding in certain grades due to sudden in-migration, explosion of a boiler, breakdown of a heating or electrical system due to antiquated installations, etc.

5. Demonstration or Trial. A need for comparison may be created by demonstrating how improvements may be made.

6. Building on Past Experiences. For instance, the recent successful introduction of new curriculum offerings (languages, sciences, etc.) or other programs (expansion of physical education or vocational courses) may be used to show that a new program is necessary and beneficial.

7. Channeling Complaints. If the public is against some aspect of the school system, it may be possible to channel this negative attitude into support for positive action.

8. Survey or Questionnaire. The process of planning, conducting, and analyzing a survey on school needs gives participants a clearer insight into the problems involved and may bring useful suggestions to the planning committee's attention.

There are many specific means of communicating with the public, and school planners should select the methods that will prove most effective in their community. For all the opportunities provided by modern technology, the person-to-person approach remains by far the best public relations procedure. Civic organizations, the P.T.A., clubs, and other associations offer an opportunity for this two-way exchange of information. Telephone campaigns and surveys (mentioned above) are also helpful in ascertaining community attitudes and opinions.

Public informational meetings can be held by the school board and staff. Such a meeting would be especially timely after the educational specifications have been formulated in order to bring the public up-to-date and to give citizens an opportunity to react and to make suggestions.

Newspaper articles are an excellent means of presenting a program. Editors and reporters should be asked for suggestions. Since effective newspaper use means continuous use, series of articles should be planned, presenting the facts as simply as possible in a well-organized format. If acceptable to the paper, pictures should be used wherever feasible.

Radio and television offer the same advantages of reaching large sections of the public at one time. Use should be made of these media if it can be done without incurring too much expense.

A newsletter, nocice, leaflet, flyer or inserts with school mailings can be used throughout the program to disseminate information and to announce hearings or meetings.

One of the final and perhaps most important sources of information for the public is the brochure or report of the project which will be presented for their approval. The contents of the brochure should be well planned: sufficient information must be included to provide full coverage of all aspects of the program, but care must be taken to keep the presentation brief and concise. The following features might be incorporated in this publication:

1. An attractive cover, possibly with a colored drawing of the new school or addition. A black and white photograph may be used if color is too expensive.

2. A section explaining the need for new construction. This might include enrollment projections, an analysis of present buildings, program needs, community needs and use. Tables, graphs, and charts are effective.

3. An explanation of how the proposed construction will meet these needs.

4. A floor plan or drawing of construction, with each room labeled and easily identifiable.

5. A section on the financial aspects of the program. This would include an estimated budget for the project, the borrowing capacity of the district, tax valuations of the district, means of obtaining funds, the cost of borrowing money, the estimated annual effect on the tax rate, and any other pertinent details.

6. A section on the advantages of the project for the children and the community in general. Statements from citizens might be included here.

7. A complete list of committee members by area of activity. This will inform the public that the project has been developed with thorough, careful planning.

The brochure can be printed as a separate pamphlet or published in a local newspaper with wide circulation. Discretion is advisable in choosing the format since many communities might tend to interpret an extravagant, elaborate publication as an indication that the building will involve unnecessary expense. If a public relations committee has been working closely with the planners at every stage, the information gathered from the public and familiarity with the community will be helpful in making this decision.

CHAPTER XV - PROCEDURES - APPLYING FOR BUILDING AID

The purpose of this chapter is to outline the procedure that applicants must follow to have building projects approved for building aid. The procedure follows the provisions of the law for building aid, RSA Chapter 198:15 and the policies of the State Board of Education. Persons concerned with building projects should be thoroughly familiar with the contents of the statute.

STATE BOARD OF EDUCATION POLICIES

ELEMENTARY SCHOOL -- Any school district planning the construction of an elementary school, or an addition thereto, with a current enrollment adequate to permit assigning one grade to a teacher, will be eligible for full reimbursement of school building aid under the provisions of RSA 198:15a-h, if all other requirements are fulfilled, including the approval of site, plans and specifications.

Any school district planning the construction of an elementary school or addition of less than four classrooms, or with a current enrollment that will not permit assigning one grade to a teacher, must first present its project to the State Board for approval before being considered for aid under RSA 198:15a-h.

HIGH SCHOOL -- Any school district planning the construction of a high school, or an addition thereto, with a proposed program of studies and curriculum that under the minimum standards for high schools would result in an approved status for such school after evaluation by the State Department of Education, will be eligible for full reimbursement of school building aid under the provisions of RSA 198:15a-h if all other requirements are fulfilled, including the approval of site, plans and specifications.

PLANS, SPECIFICATIONS AND COST ESTIMATES -- Plans, specifications, and cost estimates for school building construction must be developed by a registered architect in order to be approved by the State Board for building aid.

COST OF LAND -- Land purchased by a school district is not in itself eligible for a state grant under the school building aid law. However, if a school district purchases a parcel of land and subsequently builds a school facility thereon, in computing the amount of state building aid to be granted for such a project, the cost of the land purchased shall be added to the cost of building construction and equipment, and the land purchased becomes eligible for building aid.

FALLOUT PROTECTION -- Expenditures for fallout shelters are not approved for building aid as this building feature is not within the authority granted the Board under RSA 198:15a-h.

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STEPS IN PROCEDURE FOR BUILDING AID APPROVAL

1. Local district should notify the State Department of Education at the inception of the building program.
   a. State Department of Education consultants will be available to aid local districts in the planning and designing of the facilities. The consultants can also aid in the writing of educational specifications, if such help is desired.

2. Approval of site by the Department of Education
   a. This will be done only after the following have been completed:
      (1) Completion of a site evaluation. Suggested Site Inspection and Worksheet given in Appensix of this Guide.
      (2) Approval of site by the N.H. Water Supply and Pollution Control Commission, if site is not accessible to a municipal sewage system.
   b. Written approval of site by the Department of Education (Form A24SA Site Approval).

3. Preliminary application, form A24P, will be submitted to the Department of Education with preliminary drawings and educational specifications. Preliminary approval, form A24P, will be issued upon approval of drawings and educational specifications.

4. Final drawings and building specifications shall be submitted to the Department of Education and to the Division of Safety (State Fire Marshal) for final review. Drawings and specifications must be approved in writing before they are put out for bid.

5. Form A24FM (Fire Marshal's approval) will be issued and distributed upon his approval of drawings and specifications.

6. Form A24FA (Final Approval) will be issued and distributed by the Department of Education after drawings and building specifications have been approved by the State Board of Education.

7. In accordance with RSA 198:15-c, project should not be put out for bid prior to final approval of the State Board of Education.

8. Building aid payments are made annually upon submission of Form A23 in June of each year and are based on the principal payments for bonded indebtedness in the school year when the aid is given. The final forms listed below will be completed and submitted to the Department of Education for each project before any building aid is given on a project:

   a. A24F Final detailed application.
   b. A24S Supplemental Appropriation or Capital Reserve Expenditures.
   c. A25 Bond or note register.
   d. A26 Final project specifications and costs.

9. Form A27, final audit, will be submitted to the Division of Administration upon completion of project.

The following check list will be maintained for each project by the Division of Administration and can be used by each applicant as a progress sheet as the project develops. All the necessary forms can be obtained from the Division of Administration upon request.

_____
School District

STATE DEPARTMENT OF EDUCATION
Division of Administration
Concord, N. H.

CHECK LIST -- Procedure for Project and Building Aid Approval
(For Use by the Division of Administration)

		Received and/or Processed
Application for Site Approval	A24SA	_____
Certificate, if necessary, showing approval of the N.H. Water Supply and Pollution Control Commission		_____
Site Approval	A24SAp	_____
Preliminary Application for Project Approval (With pre. drawings and Educational Specs.)	A24P	_____
Preliminary Approval	A24PA	_____
Detailed Drawings and Building Spec.		_____
Approval of project by Fire Marshal	A24FM	_____
Approval of Final Drawings and Building Specifications	A24FA	_____
Final Forms for Building Aid -- To be completed after contract is awarded and before building aid is given:		
Application for Building Aid	A24F	_____
Supplemental appropriation or Capital Reserve Expenditures	A24Sup	_____
Bond Register	A25	_____
Project Specifications and Unit Costs	A26	_____
Building Aid Record Card		_____
Final Project Report	A27	_____

APPENDIX

SCHOOL SITE INSPECTION
WORK SHEET

I. Location _____ District _____

1. Name and general location of site _____

_____

2. Site

a. Is near school population center. Yes_____ No_____

b. Is within walking distance of what percent of pupils to be served Percent _____

c. Is within the following distance in miles from most distant pupils (Circle) 2 - 4 - 6 - 8 - 10 - 12

d. Is easily accessible from improved highway Yes_____ No_____

e. Has safe means of ingress and egress Yes_____ No_____

f. Is safe distance from:

railroads	Yes___ No___	hazardous industrial plants	Yes___ No___
airports	Yes___ No___		
airways	Yes___ No___	unsightly or nonfire-proof structures	Yes___ No___
heavy traffic	Yes___ No___		

g. Is well removed from objectionable noises, odors and other nuisances Yes_____ No_____

h. Is readily accessible to:

electricity	Yes___ No___	fire protection	Yes___ No___
water	Yes___ No___	telephone	Yes___ No___
existing sewerage system	Yes___ No___		

General rating as to location:

Excellent_____ Good_____ Fair_____ Poor_____

II. Physical Characteristics:

a. Site is on high ground in relation to surrounding terrain Yes_____ No_____

b. Give brief physical description of site:

c. Site has sufficient elevation to:

avoid flooding from streams Yes___No___ avoid flooding from surface water Yes___No_____

d. Check basic soil composition

Loam_____ Gravel_____ Limestone_____
Sandy_____ Clay_____
Shale_____ Rock_____

e. Check the term which best describes the site

Farm under cultivation_____ Existing building site_____
Abandoned farm_____ Old industrial site_____
Timberland_____ City or borough lot_____
Grassland_____ Reclaimed land_____

f. The site will require clearance (Check)

Trees _____ Stone fences _____
Brush _____ Old buildings _____
Rubbish _____

g. Site shows evidence of:

soil erosion Yes___No___
swampy or wet areas Yes___No___
recent fill Yes___No___
abandoned wells, cisterns or cesspools Yes___No___
abandoned mines or quarries Yes___No___
toxic gases, smoke or obnoxious odors Yes___No_____
active mine, gas well, oil well Yes___No_____
inactive mine, gas well, oil well Yes___No_____
high pressure gas or oil lines Yes___No_____
high tension power line Yes___No_____

h. General Shape

rectangular (Ratio width to length not more than 3.5) Yes___No___
irregular Yes___No___
approximately square Yes___No_____
long axis parallel to access street or highway Yes___No_____

i. Site can be developed without:

a large amount of fill Yes___No___
retaining walls Yes___No___
extensive cut, or regrading Yes___No_____
culverts or bridges Yes___No_____

j. Road systems on site can be kept within reasonable limits of economy Yes___No_____

k. Estimated cost of site:

acquisition $_____ preparation to receive the building $_____

development $_____

III. Adequacy:

a. Total acreage in site _____acres

b. Total usable acreage _____acres

c. Will site provide adequate space for:

building and approaches	Yes___No___	elementary play areas (3 areas)	Yes___No___
Secondary play areas: track, football & baseball	Yes___No___	parking	Yes___No___
Boys' play area	Yes___No___	gardens, landscaped area, etc.	Yes___No___
Girls' play area	Yes___No___	probable additions	Yes___No___

Note: Separate work sheets should be completed for each site. Comparative evaluation should be made for determining best site.

SUGGESTED SCHOOL SITE SITE RATING FORM

The following rating form can easily be completed from the information listed in the school site inspection worksheet. The values may be revised to indicate local preferences. Rating for each site under consideration will be invaluable to those making the final selection of a school site.

INSTRUCTIONS: Score items as follows: 5-Superior, 4-Good, 3-Average, 2-Fair, 1-Poor, 0-Unsatisfactory.

	SITE A	SITE B	SITE C
I. SIZE AND LOCATION			
State Standards			
Future Expansion			
Accessibility			
Proximity to Potential School Population			
Traffic Arteries.			
II. TOPOGRAPHY			
Soil			
Contour			
Drainage			
Shape			
Elevation			
III. ENVIRONMENTAL FACTORS			
Nature Study			
Recreational Use			
Preservation of Natural Beauty. .			
Effect Upon Surrounding Area. . .			
Compatible with Zoning, etc.. . .			
Attractiveness-Aesthetic.			
IV. HEALTH AND SAFETY			
Odors			
Dust			
Noise			
Water Supply			
Sewage Disposal			
Fire Protection			
V. HAZARDS			
Gas Lines			
Electric Power Lines			
Traffic-R.R., Air, Highways . . .			
Topography-Streams, Ravines . . .			
VI. INITIAL PURCHASE COST			
VII. DEVELOPMENT COSTS			
Area for Building			
Play and Athletic Areas			
Access Roads			
Walkways			
Soil Characteristics			
Grading and Filling			
Ground Water-Drainage			
Service-Utilities			
TOTALS			

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Suggestions for the Selection of an Architect for a School Building Project

When an architect is invited to express an interest and submit qualifications for evaluation, he should be given as much pertinent information about the client and the project as possible. The following is considered the minimum information to be supplied to the prospective architects:

1. Name, address and responsible administrative office of the client.
2. Name and phone number of the individual who will act as negotiator or contact.
3. Description of the project (or projects) under consideration, giving their size in terms of: number of students, location, area required, and other information normally included in the educational planner's statement on program and space needs.
4. Time schedule proposed for the project(s).
5. Brief statement about the planning procedure to be used, the people to be involved and the proposed assignment of responsibilities representing the client.
6. Description of the community, the educational system and resources available.
7. Brief statement of the educational philosophy on which the architectural planning should be based.

When inviting architects to submit their qualifications for consideration, the following information should constitute a part of that request:

1. Name, address, and type of organization.
2. Brief history of the firm, including date established, record of growth, types of work, and any specialties.
3. List of principals and key staff, with the professional background, registration and affiliations of each.
4. List of projects completed in recent years, giving type, size, cost, location and dates.
5. List of references, including clients, contractors, and financial institutions.
6. Statement of philosophy and approach to the design and construction process.
7. Statement of policy in the handling or procedure of a project; participation of principals, assignment of personnel to project, engineering services, and other specialized services.
8. Copy of firm's brochure plus plans and photographs of completed buildings.

When the basic information suggested above has been submitted, it should be possible for a client to select three or four architects for personal interviews. Those selected should be firms whose experience, background and interest indicate they are best qualified for the project under consideration.

The personal interview gives the architect the opportunity to expand on the written material submitted, to provide additional information, to introduce

key members of his staff who would be involved in the project, and to cover in more detail his philosophy and how it is reflected in his work. It gives the client the opportunity to clarify any points which may be unclear and to ask specific, detailed questions. Most importantly, it provides an opportunity for the personal interaction of a face-to-face meeting and the client's evaluation of the architect as a person.

To be most effective, interviews should be held in an atmosphere of genuine interest and mutual respect. Adequate time must be provided, in a pleasant setting, to permit both parties to respond to one another and for the client to make an honest evaluation of the architect.

Concurrent with these interviews, completed projects of the architects selected should be visited, as should their offices. This experience will provide a first-hand observation of his problem-solving ability, the satisfactions obtained, and the way the architect operates his business. At the same time, references should be checked on a broad enough scale so a representative sample is obtained.

Some specific questions that might be asked during the interview are listed below:

1. How much time would you spend working with administrators, teachers, board members, citizens and the building committee in the planning of the project?

2. What surveys and tests are to be provided and who pays for them?

3. What cost estimates will the architect furnish?

4. Do your services include the over-all site development plan?

5. What are your fees relative to the following and how are they figured?

   a. Basic rate?
   b. Travel?
   c. Additional or unusual work?
   d. Public relations activities
   e. Payment of independent engineers?

6. How many sets of drawings and specifications are furnished?

7. Who owns the drawings and specifications after the job is completed?

8. If a clerk-of-the-works is employed, who selects him, who pays him, and what are his lines of responsibility?

9. What are the conditions of payment of your fees?

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a. Percentage upon completion of final drawings and specifications?
b. Schedule of payments as job progresses?
c. Final payment?

10. What method of bidding do you recommend for the project?

11. Do you ask the bidders for a list of their subcontractors?

12. When can you start work on this project, and how long will it take to complete final drawings and specifications?

TABLE I

SUGGESTED CHAIR, DESK, AND TABLE HEIGHTS

Chairs (Height of seat)	11"	12"	13"	14"	15"	16"	17"	18"
Desks	20"	22"	23"	25"	26"	27½"	29"	30"
Subprimary	10%	90%						
1st Grade		70%	30%					
2nd Grade		20%	60%	20%				
3rd Grade			10%	80%	10%			
4th Grade				30%	50%	20%		
5th Grade				10%	60%	30%		
6th Grade					20%	70%	10%	
7th Grade						60%	30%	10%
8th Grade						30%	60%	10%
Junior High School						20%	50%	30%
Senior High School							60%	40%

Chart shows approximate percentage of each size of furniture for each class. Application: Determine enrollment of given class and apply above percentages to ascertain quantity needed of each item of furniture.

TABLE II

SUGGESTED SETTING HEIGHTS

Item	SP	1-3	4-6	7-9	10-12
			Grades		
Chalk and Tackboards	26"	26"-30"	30"-33"	33"-36"	36"-39"
Counter Tops	22"	24"-27"	27"-30"	30"-33"	33"-36"
Hangar Bars	3'10"		4'8"		60"*
Guardrails (Minimum)			3½'		
Handrails		28"	28"	30"	
Drinking Fountains	24"		28"	32"	36"
Lavatories	24"		25"	28"	30"
Water Closets	10"		13"	15"	
Urinals	1 @ 15" - others 18"			22"	
Shower Heads	56"			66"	
Window Stools	36"				42"

* Lockers preferred

FALLOUT SHELTERS

The Office of Civil Defense has initiated a national fallout shelter program in an effort to provide adequate protection for as many people as possible in the event of a nuclear war, whether they are at home, at work, or at school. Since approximately 55 per cent of the population of New Hampshire has no shelter space available, the problem merits consideration by concerned citizens.

One of the more effective ways to provide shelter space in those areas of New Hampshire without fallout protection would be to encourage incorporation of shelter spaces in new construction. New schools now in the planning stages offer many advantages in this regard, and school planners might well consider installation of shelters. The Office of Civil Defense has established a Direct Mail Shelter Development System (called the DMSDS Program), which is an advanced information system for the promotion of construction of fallout shelters in new buildings through the identification of owners and architects of proposed construction projects. The DMSDS will provide professional assistance through University Service Centers. The owner (i.e., the school district) and the architect of any projected school which is to cost in excess of $100,000 will receive a letter from the Office of Civil Defense stating the need for additional fallout shelter spaces and suggesting these be included within the new construction. A questionnaire on which the architect may indicate his interest in participating in such a program accompanies the letter. The completed questionnaire is to be forwarded to the State University Advisory Center at the Thayer School of Engineering, Dartmouth College, Hanover, N.H.

The Advisory Center will consult with the committee and the architect on means for providing shelter space at minimum expense to the district. The basic technique for achieving fallout protection is through "slanting," which involves the incorporation of certain architectural and engineering principles into new structures at little or no increased cost. The addition of this feature to the other design criteria for the new structure should receive serious consideration by the committee.

A clear understanding of the protective requirements against fallout could result in the adoption of other means of protection for personnel and materials without extra cost and with no sacrifice of aesthetics or operating efficiency.

The consultant service is free, and it is recommended that school planners avail themselves of this opportunity for increasing the safety of the entire community.

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